

CURRENT CONDITIONS

Thank you for inviting COSI on Wheels into your school! To enhance your students' experience, we encourage you to continue to explore weather in your classroom or home.

Extension Activities:

- Tumble Wing Walkalong Glider
- The Incredible Journey
- Full of Hot Air
- Make Your Own Barometer
- Cohesion Coin
- Booklist

TUMBLE WING WALKALONG GLIDER

ACADEMIC STANDARDS:

Earth and Space Sciences 4.1, 4.4
Physical Sciences K.1, K.5, 1.5, 1.6
Science and Technology 1.1

OBJECTIVE:

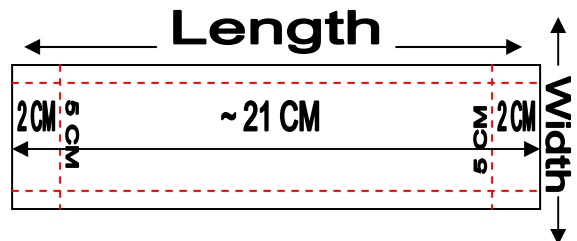
- Students will be able to describe that air surrounds and affects other objects.
- Students will be able to explain that air is made up of molecules that exert pressure on objects.

MATERIALS:

Phone book paper (or any light weight paper) - 1 sheet will accommodate 2-3 students.

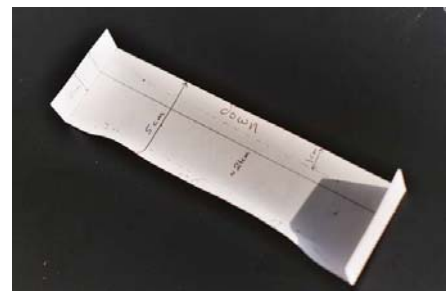
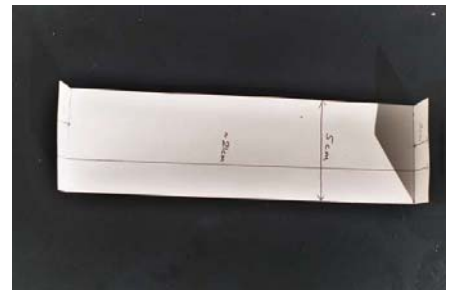
3-4 pieces of large cardboard or plexiglass material. Approximately 4-6' in surface area.

Scissors Rulers Pencils



PROCEDURE:

1. Cut phone book sheet into a strip of 5 cm in width.
2. Cut strip so the overall length is approximately 21 cm.
3. Measure and draw two dotted lines across the width of the strip. These lines should each be 2 cm from the end of the strip.
4. Fold across the dotted line to form two small tabs. These folds should form two 90° angles that face the same direction. These are the wings of the glider.
5. Fold the length edges over slightly as shown in the picture below. These folds should face in the opposite direction. The fold that goes down is the leading edge and the other fold that goes up is the trailing edge.
6. Your glider is now complete and ready to fly. To launch the glider, hold the glider so that the leading edge is facing out and the wings are facing up. Once the glider is in position you can let go and it will tumble to the ground. If the glider falls to one side or the other, the wing folds are not symmetrical and will need to be adjusted.



TUMBLE WING WALKALONG GLIDER (continued)

7. Once your glider is functioning properly it is time to guide your glider. As the glider falls hold the piece of cardboard or plexiglass directly under the glider. As your glider moves forward, continue to walk forward with the cardboard or plexiglass under the glider. The glider will stay in the air and you will be able to guide it around the room.



WHAT HAPPENED: What is keeping the glider from falling to the ground? How does the board keep the glider in the air without touching it? How does the glider's design keep it flying? Even though you cannot see air, can you still feel or even see the effects of air?

Try different kinds of glider designs and see if they work. Also explore paper airplane designs and examine how the design of the plane interacts with the air around it.

A "glider" is defined as an aircraft that is not powered. The design of gliders help the aircraft use rising air to fly. Gliders can use pockets of rising air to travel long distances before finding the next source of lift. The sport of gliding became popularized in post World War I Germany. Restrictions in the Treaty of Versailles placed strict restrictions on powered aircraft. Germans turned to designing and developing more effective and efficient gliders. One of the first gliding competitions, the Wasserkuppe, was held in Germany in 1920.

THE INCREDIBLE JOURNEY

ACADEMIC STANDARDS: Earth and Space Sciences K.1, 4.2, 4.3, 4.8, 4.10
Physical Sciences 1.1, 1.2, 1.3, 1.4, 1.8, 4.1, 4.4

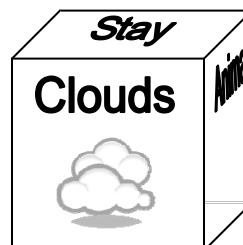
OBJECTIVE: Students will be able to describe the movement of water within the water cycle. Students will also be able to identify the different states of water as it moves through the water cycle.

MATERIALS:

- 9 large pieces of paper
- Pens or pencils
- Notebooks or journals
- Construction paper
- 9 boxes, about 6 inches on a side

These boxes will be used to make the dice for this activity. Gift boxes used for coffee mugs are the correct size. If similar boxes are not available it is still possible to create dice by taping squares of paper together in the form of a cube. There will be one cube at each of the nine stations, but more dice can be added to increase the pace of game.

- Bell, whistle, buzzer, or some sound maker to indicate turns
- Large room or playfield



PROCEDURE:

Constructing dice

1. Nine dice will need to be constructed for this game. Each die represents one of the nine stations water can move through: clouds, plants, animals, rivers, oceans, lakes, ground water, soil, and glaciers.
2. For each die, cut out six equally-sized squares from the construction paper.
3. Use the chart below to create the six sides of each die. Students may illustrate dice to match the words on the die.
4. After the six sides have been created, tape them together to form a cube or tape them to the sides of your box.
5. Nine signs need to be placed throughout the room or area to demonstrate the different stations (Soil, Plant, River, etc.).
6. After all nine dice and signs have been created the class is ready to begin their 'Incredible Journey' through the water cycle.

Water Cycle Table

STATION	DIE SIDE LABELS	EXPLANATION
Soil	one side <i>plant</i>	Water is absorbed by plant roots.
	one side <i>river</i>	The soil is saturated, so water runs off into a river.
	one side <i>ground water</i>	Water is pulled by gravity; it filters into the soil.
	two sides <i>clouds</i>	Heat energy is added to the water, so the water evaporates and goes to the clouds.
	one side <i>stay</i>	Water remains on the surface (perhaps in a puddle, or adhering to a soil particle).
Plant	four sides <i>clouds</i>	Water leaves the plant through the process of transpiration.
	two sides <i>stay</i>	Water is used by the plant and stays in the cells.
River	one side <i>lake</i>	Water flows into a lake.
	one side <i>ground water</i>	Water is pulled by gravity; it filters into the soil.
	one side <i>ocean</i>	Water flows into the ocean.
	one side <i>animal</i>	An animal drinks water.
	one side <i>clouds</i>	Heat energy is added to the water, so the water evaporates and goes to the clouds.
	one side <i>stay</i>	Water remains in the current of the river.
Clouds	one side <i>soil</i>	Water condenses and falls on soil.
	one side <i>glacier</i>	Water condenses and falls as snow onto a glacier.
	one side <i>lake</i>	Water condenses and falls into a lake.
	two sides <i>ocean</i>	Water condenses and falls into the ocean.
	one side <i>stay</i>	Water remains as a water droplet clinging to a dust particle.
Ocean	two sides <i>clouds</i>	Heat energy is added to the water, so the water evaporates and goes to the clouds.
	four sides <i>stay</i>	Water remains in the ocean.

Lake	one side <i>ground water</i>	Water is pulled by gravity; it filters into the soil.
	one side <i>animal</i>	An animal drinks water.
	one side <i>river</i>	Water flows into a river.
	one side <i>clouds</i>	Heat energy is added to the water, so the water evaporates and goes to the clouds.
	two sides <i>stay</i>	Water remains within the lake or estuary.
Animal	two sides <i>soil</i>	Water is excreted through feces and urine.
	three sides <i>clouds</i>	Water is respired or evaporated from the body.
	one side <i>stay</i>	Water is incorporated into the body.
Ground Water	one side <i>river</i>	Water filters into a river.
	two sides <i>lake</i>	Water filters into a lake.
	three sides <i>stay</i>	Water stays underground.
Glacier	one side <i>ground water</i>	Ice melts and water filters into the ground.
	one side <i>clouds</i>	Ice evaporates and water goes to the clouds (sublimation).
	one side <i>river</i>	Ice melts and water flows into a river.
	three sides <i>stay</i>	Ice stays frozen in the glacier.

The Incredible Journey (continued)

1. Tell students that they are going to become water molecules and will be moving through the water cycle.
2. Introduce the nine stations (clouds, animals, plants, rivers, oceans, lakes, ground water, soil, and glaciers) that represent the places water can move through and identify station locations in play space.
3. Assign an even number of students to each station. The cloud station is the only station that can have an uneven number.
4. Have students at each station discuss the different places water can go from their station in the water cycle. Assist student discussions by leading a discussion on the conditions that cause water to move. For example, water movement depends on the sun's energy, the earth's electromagnetic energy, and gravity. Sometimes water will not move even when exposed to these energies. Have students make lists of the places they think the water may go.
5. After the stations have made their lists, hand each station their die so students can compare their list to where the water can actually move.
6. Have students discuss the different forms in which water moves from location to location. Most movement will take place while water is in its liquid phase.
7. Tell students that they will be mimicking the movement of water. When they move as liquid water they must move in pairs. When they move as water vapor they can move individually.
8. Students will determine their movement by rolling the die at each station. Students will line up behind the die at each station. Students will line up in pairs at every station except the cloud station where they will form a single file line. Students roll their die and move according to the face of the die. If the die reads "stay," the student will head back to the end of the line and wait for another turn to roll. In the 'Clouds' line, students will roll individually. If they are instructed to leave the 'Clouds' they must grab a partner (the person immediately behind them).
9. As they move students will be carrying a notebook or journal to can keep track of their movements.
10. Tell students the game will begin and end with the sound of the bell.

The Incredible Journey¹ (continued)

WHAT HAPPENED: What are the different forms that water can take? What causes the water to move and change form? Could you predict where you would go next as water molecules? Does the water cycle act like a normal cycle? Does it work in a continuous, unchanging circle? How can water be polluted during the cycle? How does the cycle help to cleanse polluted water?

Despite being called the water cycle most of the world's water stays put in storage. The biggest of Earth's "storehouses" of water are oceans. Of the estimated 332,500,000 cubic miles of water on earth, about 321,000,000 cubic miles of that water is located in the oceans. That means that 96.5 percent of Earth's water is located in the oceans. Other storehouses of water can include ice caps and glaciers. As a result, as temperatures around the world rise and glaciers and ice caps melt, the amount of water in the oceans increases. For example, about 125,000 years ago during a warm period in Earth's history the ocean levels were 18 feet higher than the present levels. Conversely, during colder periods more of Earth's water is stored in glaciers and ice caps. During the last ice age ocean levels were as much as 400 feet lower than the present ocean levels.

¹ **The Incredible Journey:** (1995). *The Project WET Curriculum and Activity Guide*. Bozeman, MT: The Watercourse and Western Regional Environmental Education Council, pg. 161.

FULL OF HOT AIR

ACADEMIC STANDARDS: Earth and Space: 2.4
Earth Systems: 4.1, 4.2, 4.3
Physical Sciences: 1.8, 4.4

OBJECTIVE: To demonstrate that warm air takes up more space than cooler air.

MATERIALS:

Empty 2 liter bottle
Tub of hot water
Balloon

PROCEDURE:

- 1.** Stretch the balloon over the mouth of the 2 liter bottle.
- 2.** Place the bottle in the tub of hot water.
- 3.** Leave it standing for 5 minutes.

WHAT HAPPENED: As the heat from the hot water warms the molecules of the air inside the bottle, the molecules start to move faster and spread out. The molecules, outgrowing the space of the bottle, move into the balloon, inflating it.

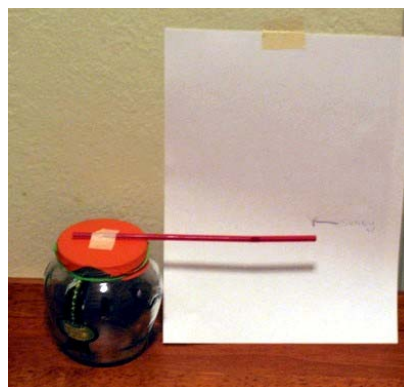
MAKE YOUR OWN BAROMETER²

ACADEMIC STANDARDS: Earth and Space Sciences 4.1, 4.5
Physical Sciences 1.5
Science and Technology 1.2, 1.7, 3.1

OBJECTIVE: Students will be able to demonstrate the changes in atmospheric pressure by constructing their own barometer.

MATERIALS:

Balloon
Narrow-mouthed jar
Rubber band or piece of string
Glue
Drinking Straw
Piece of Paper



PROCEDURE:

1. Blow up the balloon carefully and then let all of the air back out. This is to stretch the balloon.
2. Cut the balloon, halfway, into two pieces. Discard the piece with the neck of the balloon.
3. Carefully stretch the other half of the balloon over the opening of the jar and then put rubber band around the rim of the jar, so the jar becomes airtight. Make sure the balloon is taut around the rim of the jar.
4. Glue or tape the straw to the top of the balloon. The straw should sit so that there is about 1 cm of space between the rim of the jar and one end of the straw.
5. Tape a piece of paper to the wall behind the straw of your new barometer.
6. As the outside air pressure becomes less than the air pressure in the jar, the balloon will expand and cause the straw to dip down. As the outside air pressure increases and becomes higher than the air pressure in the jar, the straw will rise as the balloon retracts.
7. Students should check their barometer daily and mark its reading and date on the paper. Students should be able to track if the air pressure is increasing or decreasing by using their barometers.

² **Make Your Own Barometer:** Churchill, E.R., Loeschnig, L., and Mandell, M. (1997). *730 Easy Science Experiments*. New York: Tess Press, pg. 249.

MAKE YOUR OWN BAROMETER (continued)

WHAT HAPPENED: What caused the straw to move up and down? Was the air pressure falling or rising when the straw moved downward? What kind of weather do you notice when the air pressure was falling? What weather patterns were typically observed when the air pressure was rising?

Atmospheric pressure is the weight of the air pressing down on the Earth. This air includes all the layers of the Earth's atmosphere, a thin layer of gases that surrounds the Earth. The atmosphere is composed of 78.084% Nitrogen, 20.947% Oxygen, 0.934% Argon, 0.033% Carbon Dioxide, and .002% traces of other gases. The atmosphere is divided up into many layers. The layer that is closest to the Earth's surface is called the troposphere. This layer can be anywhere from 4-12 miles high and can have temperatures ranging from 62°F to -60°F at the very top of the layer. The highest part of the atmosphere, the exosphere, can reach to 6,200 miles above the Earth!



COHESION COIN

ACADEMIC STANDARDS: Scientific Inquiry: 1.6, 2.6, 5.1 Ways of Knowing: 3.1

OBJECTIVE: To demonstrate the property of cohesion between water molecules.

MATERIALS:

A few coins
A water dropper
Water

PROCEDURE:

Lay a penny on the table. Have students form a hypothesis about how many water drops can fit on a penny, without spilling onto the table.

Use the water dropper to begin to put drops of water on the coin, counting as you go. Continue to add drops until the water domes up, eventually spilling over onto the table.

WHAT HAPPENED: Cohesion can be defined as an 'intermolecular force that holds together molecules in a solid or liquid'. Due to the polarity of individual water molecules (all of the electrons are gathered on the Oxygen side of the molecule), the negative side of one water molecule is attracted to the positive side of another water molecule. The force which draws the molecules to one another is called **hydrogen bonding**, which is an attractive force between a hydrogen atom in one molecule and a strongly electronegative atom (such as Oxygen) in another molecule. Cohesion between water molecules is what allows them to 'bead' up without spilling over onto the table.



Weather

Grades K-6

Books at the Columbus Metropolitan Library, 96 South Grant Ave.

FICTION

Hello, Sun! by Dayle Ann Dodds, 2005.

Picture Book DODDS

A young girl and her cat must change clothes many times as the weather goes from sunny to cloudy to rainy to snowy.

Un-Brella by Scott E. Franson, 2007.

Picture Book FRANSON

In this wordless book, a little girl uses her magic umbrella to give her the weather she wants, regardless of what the weather conditions really are outside.

Rainy Day! by Patricia Lakin, 2007.

Picture Book LAKIN

Four young crocodiles find all sorts of ways to keep busy on a rainy day.

Water Dance by Thomas Locker, 1997.

Picture Book LOCKER

Water speaks of its existence in such forms as storm clouds, mist, rainbows, and rivers. Includes factual information on the water cycle.

NON-FICTION

Ask Dr. K. Fisher: About Weather by Claire Llewellyn, 2009.

j551.5 L791a

Dr. K. Fisher is a wise bird, and the letters that pile up in his mailbag are always answered. A self-conscious stork, a thirsty lizard, and a soggy orangutan seek advice from the doctor in this edition.

I Face the Wind by Vicki Cobb, 2003.

j551.518 C653i

Many simple ways of discovering the wind's workings are found in this playfully illustrated but scientifically informative book.

Storms! by Miriam Cohen, 2009.

j551.55

Beautiful glossy photographs and large, simple text are paired in this high-impact book about storms. Jokes at the top of every page bring a fun dimension to this educational topic.

On the Same Day in March: A Tour of the World's Weather by Marilyn Singer, 2000. J551.6 S6172o

Highlights a wide variety of weather conditions by taking a tour around the world and examining weather in different places on the same day in March.



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