MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

DISCOVERY SCIENCE CENTER

Kindergarten ~ Teacher Packet

Theme: Forms of Water

California State Science Content Standards addressed:

Physical Science:

- Water can be a solid or a liquid and can be made to change back and forth from one another.
- Water left in an open container evaporates (goes into the air) but water in a closed container does not.

Earth Science:

- Resources are used in everyday life and many resources can be conserved.

Key Vocabulary:

Liquid Solid Gas

Key Concepts:

Forms of Water Conservation Condensation Evaporation

Prompting and Closing Questions:

1. What are the three forms of water? (liquid, solid, gas)
2. How can you change liquid water into solid water? (freeze it; make it cold)
3. How can you change solid water into a liquid? (melt it; heat it)
4. Can water go into the air if it is in a completely closed container? (no)

The prompting and closing questions focus on the standards listed above, will be used by the program instructor during the visit to your school, and will be incorporated into the take-home Ricki the Raindrop activity booklets distributed to your students.

Background Information for the Teachers:

Solids, Liquids and Gases ~ The 3 Forms of Matter

There are three common forms of matter: solid, liquid and gas. The differences between these three forms depend on the motions and forces of the molecules or atoms of which they are composed.

- A solid has a definite shape and volume (i.e. a block of wood).
- Liquids have definite volumes and assume the shape of their containers (i.e. water in a cup).
- Gases expand to fill the volume and take the shape of their containers (i.e. oxygen).

The atoms of a solid material are very close together and although all of the atoms are moving, or vibrating, they are moving very slowly.

Not only does a liquid have a definite volume and assume the shape of its container, it is also free-flowing. In other words, we can pour a liquid and it all sticks together as a unit while we pour it. The atoms in a liquid are typically farther apart and vibrate faster than in the solid form, but these atoms still remain in contact with each other.

Since a gas has neither a definite shape nor volume, it expands indefinitely. Therefore, it needs a lot of space. The atoms of a gas spread out, passing and occasionally banging into each other.

If the temperature and/or pressure are adjusted, matter may undergo a phase transition. During a phase transition, matter shifts between these three forms. There are different ways matter can shift from one form to another: melting, freezing, evaporating, condensing, and subliming.

- Melting – changing from a solid to a liquid
- Freezing – changing from a liquid to a solid
- Evaporating – changing from a liquid to a gas
- Condensing – changing from a gas to a liquid
- Subliming – changing from a solid to a gas

Examples of these phase transitions:

- Melting – an ice cube melting
- Freezing – the opposite process of melting; freezing water into an ice cube
- Evaporating – steam rising from the surface of boiling water
- Condensing – moisture forming underneath the lid of a boiling pot
- Subliming – solid carbon dioxide (dry ice) changing into carbon dioxide gas

Activity: GLOP

Materials:

- 1 large mixing bowl
- 1 box (16 oz.) of cornstarch
- Measuring cup
- Water
- Wooden spoon
- Paper towels

Procedure:

1. Display the water and the box of cornstarch to use as models while leading a class discussion on the properties of liquids and solids.
2. Ask the students to name other liquids than water, and to name other solids than the box of cornstarch.
3. Pour the cornstarch into the mixing bowl.
4. Add about 1 ½ cups of water to the cornstarch.
5. Mix the two ingredients together until they form a thick paste (it will look like pancake batter). Add more water if needed, but make sure the mixture does not become too thin.
6. Let the mixture settle in the bowl for a minute.
7. Grab a clump of it in your hand and let it run down your hand like a liquid.
8. Next, grab more of the mixture and roll in your hands very quickly to demonstrate how its acts like a solid.
9. You can also demonstrate this by stirring the mixture with a wooden spoon ~ stir it fast and it turns into a solid. Stop stirring and it turns into a liquid again.
10. Or push the spoon in slowly, then try to pull it out quickly…it will become stuck in the mixture.
11. This experience can also be performed by the students ~ we recommend doing this activity outdoors as it can get messy.

Conclusion:
When a small amount of force is used, the Glop acts like a liquid, but when more force is applied, it acts like a solid (having definite shape and volume). This activity can be used to show the students how a substance can move from a liquid-like form to a solid-like form and vise versa during this exploration of changes in physical properties.

Ricki the Raindrop and the Forms of Water

Materials:

- Ricki Raindrop booklets (you will receive these following the class presentation)
- Ice cubes
- Water
- Empty cups
- Two identical jars; one tight-fitting lid

Procedure:
Use the Ricki Raindrop booklets to review with the students the three forms of matter, especially how the concept applies to water. Have the students go through their booklets at school or at home with their parents. The students should answer all of the questions asked in the booklet; remember, it is an important science-thinking and language-building skill to have the students articulate what they think or know.

Also, have them perform all of the activities, such as: (1) experiencing the solid nature of ice cubes by holding them in their hands and by placing them in the empty cups to observe them as they melt; (2) pouring water from one cup to the next, focusing on the flow of water; (3) and observing the evaporative process of water in an open container.

Ask your students the prompting and closing questions as a check for understanding.

Conservation of Resources Activities:

The Orange County Department of Education has delivered a copy of the "Water Cycle" and "Water, Who Needs It?" video and accompanying posters to each OC public school district's curriculum director for distribution to all elementary schools in their district. Please check with your school Principal or librarian to check out this and other incredible resources provided by the California Department of Water Resources.

Additional resources may be obtained from the Department of Water Resources for free at www.publicaffairs.water.ca.gov/education/orderform.cfm

Resources, such as water, are used in everyday life.
Encourage student input as you create a list of ways that your students use water during the day. Give them an assignment to either find or draw pictures of these uses of water (i.e. drinking water, pets drinking water, watering plants, playing in the hose, taking a bath, etc.) Design a "Water Uses" bulletin board for your classroom.

Give each student a 16 – 20 oz. bottle of water to use during their school day. Have them drink from the bottles and wash their hands with the bottled water during the day. If possible, have them use this water during their snack or lunchtime, instead of their typical drinks. Discover how long before their water bottles require refilling.

Many resources, such as water, can be conserved.
Use the students' pictures of "Water Uses" to discuss conservation. Brainstorm some of the uses that could lend themselves to conservation, such as (1) turn off the water when you brush your teeth; (2) don't fill the bathtub full; (3) put dropped or unused ice cubes in a houseplant's pot or in the pet's water dish.

Have the students design new pictures to be placed on the "Water Uses" bulletin board or to share with their family reflecting ways to conserve water. If anyone has water left in their bottles at the end of class time, have them reflect on the best way to use the remaining water (i.e. save it for later, water a houseplant, etc.).