THE NEW YORK BOTANICAL GARDEN

The Role of Plants in the Water Cycle

Pre-/Post-Visit Activities

Thank you for registering for the GreenSchool Workshop *The Role of Plants in the Water Cycle*. During this workshop, your students will learn the role of basic plant parts and explore the vital role they play in our food chain. The following selection of pre- and post-visit activity ideas and recommended resources is designed to support 6-8th grade classroom integration of the concepts addressed in *The Role of Plants in the Water Cycle*.

Pre-visit Activity Ideas

Phase changes of water molecules
Students learn about the phases of water and how changes in temperature affect molecules.

Materials:
- glass of ice water

Ask students to make observations of the glass of water. *What is happening to the ice, the water, and the glass? Why do they think these things are occurring?* Discuss phase change and how an increase in energy or temperature can change ice into water and water into water vapor. Molecules of solids are locked together and vibrate slightly, while molecules of liquids and gases have more energy and move more freely.

Take the students outside or to the gymnasium. Each student represents a molecule of water in the glass. Have them stand in a several rows and interlock arms. Here they are representing ice, the solid form of water. They can shiver and vibrate, but must remain interlocked. Now, imagine that they have been placed next to a sunny window, and have begun to warm up. They have melted into liquid water and can now loosely hold hands and flow around the area. Now, the sun has made it very warm and they have so much energy that they can break apart and move around freely as a gas. Next, take them back through the phases until their arms are linked again as the sun sets and the temperature is falling.

Have the students sit down for a discussion. Review the phases of water and that the changes were caused by energy changes. The energy is provided by the sun. Discuss that while water changes phase constantly, it is conserved. All of the water in the world today is recycled and very old, as old as the dinosaurs.

Post-visit Activity Ideas

Cloud Formation
Students learn to how identify the chemical reactions that are involved in the formation of clouds.

Materials:
- 400-500ml beaker or jar
- plastic wrap
- water
- rubber band
- matches
- ice cubes

Fill the beaker or jar about half way with lukewarm water. Light a match and hold it over the beaker. You will blow it out gently using your breathe to force some of the smoke in to the beaker. Quickly cover the beaker with the plastic wrap and rubber band to make airtight. Observe the beaker for any change in the air above the water. After 30 seconds place 2-3 ice cubes on top of the plastic wrap. Observe again for any changes.

Why was there little, if any, change in the air before the cubes were placed over the top? *There were not enough of the right conditions present for cloud formation to occur.*

What conditions for cloud formation were present before the ice was added? *Water and smoke particles*

Explain the change you observed after the ice was added. *The temperature of the air dropped enabling the water to condense onto the smoke particles forming clouds droplets and therefore, a cloud.*

What condition that is often involved in a cloud formation was not present in this experiment? *A drop in air pressure.*

When you see fog, what are you actually seeing and what caused it to form? *It is a cloud over the earth's surface due to a sufficient amount of water molecules and dirt particles in the air, along with a drop in air pressure and/or temperature.*

Vocabulary Key

Molecule – Two or more atoms held together by chemical bonds.

Condensation – Change in matter to a denser phase due to cooling or compression. For example: from a gas to a liquid. The molecules lose energy and vibrate less frequently.

Evaporation – Change in matter to a less dense phase due to an increase in energy. For example: from a liquid to a gas. The molecules gain energy and vibrate more frequently.

Transpiration – The evaporation of water from plants. Transpiration in leaves occurs through the stomata.

Precipitation – Any product of condensation of the water in the atmosphere (rain, snow, hail, etc.) that is deposited onto the earth's surface. Precipitation occurs when the atmosphere becomes saturated with water vapor and the water condenses and falls out of solution. The atmosphere can become saturated by cooling and/or the addition of moisture.

Recommended Teacher Resources

Capon, Brian. *Plant Survival: Adapting to a Hostile World.* Portland, Ore.: Timber Press, 1994.

Nadeau, Issac. *Learning About the Water Cycle with Graphic Organizers.* New York, Rosen Publishing, 2005.

Recommended Books For Children

Pollock, Steve. *Ecology.* New York: Dorling Kindersley Limited, 2000.

Truiet, Trudi S., *The Water Cycle.* Danbury, CT., Franklin Watts, 2002.

Ditchfield, Christian. *Water.* Chicago, Children's Press, 2002

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