Natural Resources - Water

WHAT'S SO SPECIAL ABOUT WATER: SURFACE TENSION

Activity Plan – Science Series ACTpa023

Project Skills:
- Discovery of chemical and physical properties of water.

Life Skills:
- Empathy – is sensitive to others' situations

Science Skills:
- Making hypotheses

Academic Standard:
The activity complements this academic standard:
- Science C. 4.2. Use the science content being learned to ask questions, plan investigations, make observations, make predictions, test predictions, and offer explanations.

Grade Levels: 3-5

Time: 10-15 minutes

Supplies Needed:
- Laminated "Amazing Water Race Water Stretch" Activity Sheet
- Penny
- Eyedropper
- Paper clips
- Cup of water

Do Ahead:
- Read through this entire activity plan and perform the experiments.
- Review "Background" and "Additional Web Links" for vocabulary and information on water properties.
- Read "Science with Kids, Science by Kids" on how to teach science.

BACKGROUND

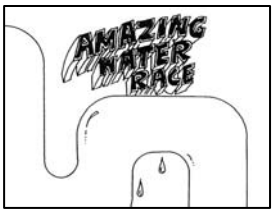
Water is a molecule made up of 2 parts hydrogen and 1 part oxygen. Children have fun learning how water "sticks together." Children become more empathetic when they listen and share their own life experiences about why people need to stick together. Surface tension is a force that holds the surface of liquids together. It ensures that the surface area of the liquid is minimized. So water droplets form spheres. It results from the fact that atoms on the surface are missing bonds that hold the molecules together. Water has a strong surface tension.

Key vocabulary words:
- *Surface tension* is the attraction of molecules to each other on a liquid surface.
- The *atom* is the smallest unit of matter that can take part in a chemical reaction. It is the building block of matter.
- A *molecule* consists of two or more atoms chemically bonded together.

WHAT TO DO

Activity: Amazing Water Race and Water Stretch

1. Take the laminated "Amazing Water Race" Activity Sheet and drop water from the eye dropper onto the *Start* circle. Move the droplet through the maze using the eye dropper to the finish line.
2. Set up multiple laminated race tracks so more than one person can do the race at the same time. Have one youth be the referee who says "Go" as well as observes who finishes first. Then switch roles with a different youth as referee.
3. Next, drop water from the eyedropper onto the *Begin Here* circle of the "Water Stretch" ruler and move the droplet to see how long it can stretch.
4. Do this activity at least three times and record the results each time.



TALK IT OVER

Reflect:
- What happened to the water drop as you took it through the race?
- What happened to the water drop on the ruler?
- Why does the water drop stick together for the maze and the ruler?
- What do you think is making water act this way?

Activity: Surface Tension

1. Place a paper clip vertically in the water. Observe what happens. (It sinks.)
2. Now carefully place the paper clip flat (horizontally) on the surface of the water. Observe what happens? (It floats.)

TALK IT OVER

Reflect:
- Why does the paper clip float when placed flat on the water?
- Why does it sink when placed vertically?
- Why is there a difference?

Sources:

- Lead author: Sally Bowers, 4-H Youth Educator, UW-Extension, Dane County.
- Contributions by: Dolly Ledin, UW Center for Biology Education and UW Adult Role Models in Science (ARMS); Tom Zinnen, UW-Extension Biotechnology Policy and Outreach Specialist; Linda Eisele, City of Madison, Office of Community Services; and Kathi Vos, Wisconsin 4-H Experiential Learning Specialist.
- "Amazing Water Race," 1988 AIMS Education Foundation, *Water Precious Water, Book A.*

Activity: How Many Drops Can a Penny Hold?

Using the eyedropper, place drops of water one by one on a penny and count how many drops you can put on the penny before it overflows.

TALK IT OVER

Reflect:

- Why does the water "stick together" before it spills over?

Apply:

- When is it important to "stick" together with your family?
  - With your school?
  - With your friends?

ENHANCE

- Do the same experiments with other liquids like oil or liquid soap and make comparisons to water molecules. Share some personal life stories about sticking together and not sticking together.
- Use a straw to blow the water along the race and ruler. What is the difference between using a straw and an eye dropper?

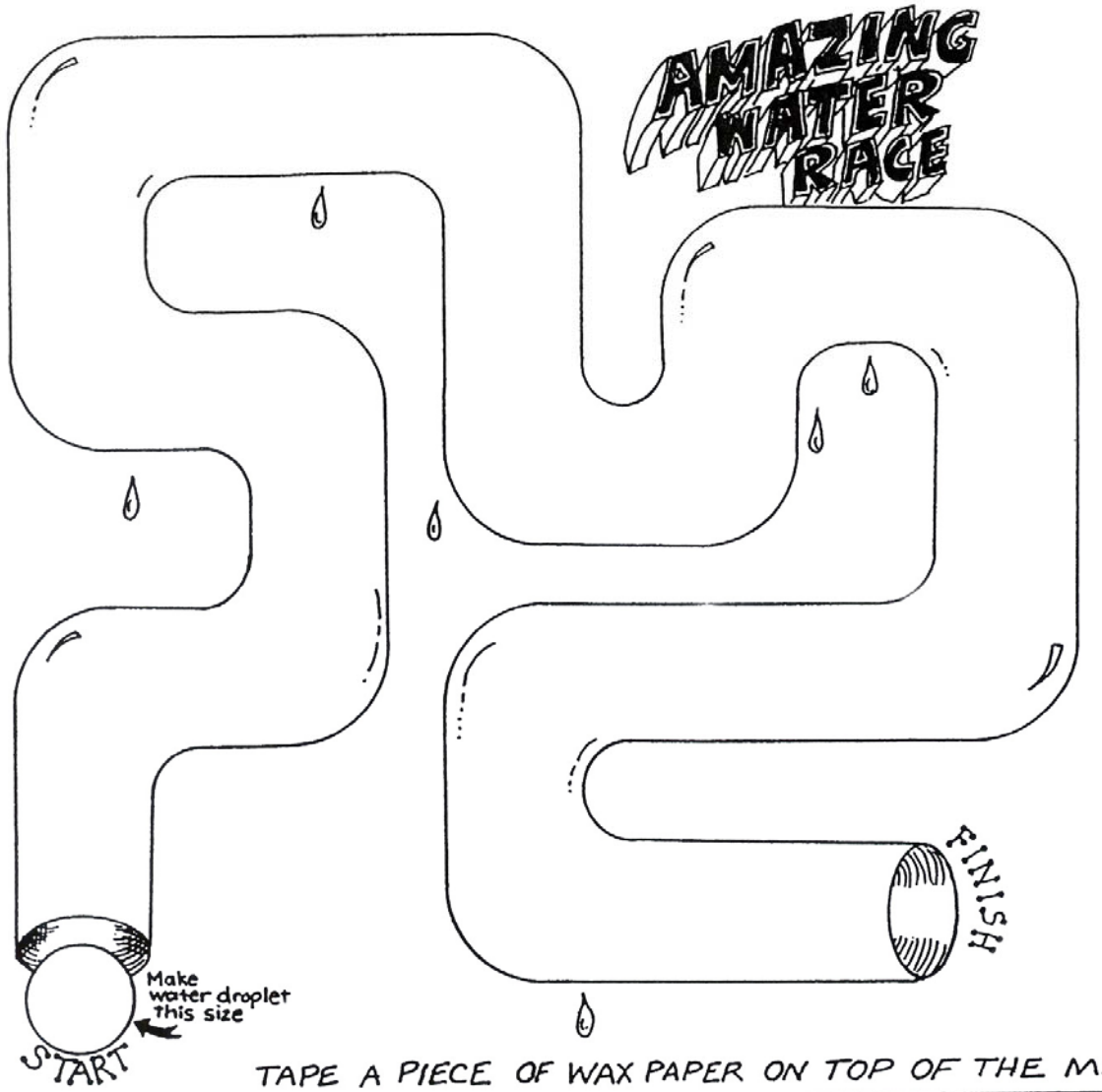
HELPFUL HINTS

- Best practice with floating paper clip is to place gently on the surface of the water. The water molecules are held tightly together like a magnet which creates the surface tension and allows the clip to remain on the surface. The vertical clip is like a swimmer diving into a pool of water. The surface tension of the water is disrupted such that the clip sinks to the bottom.

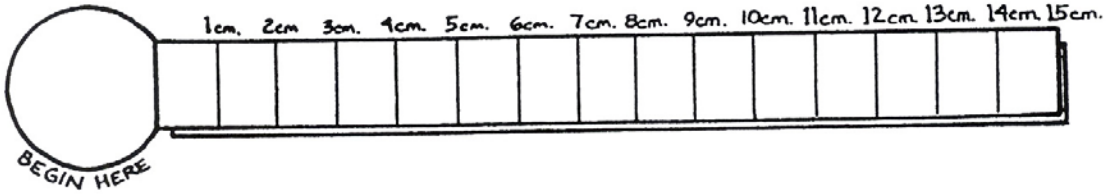
ADDITIONAL WEB LINKS

- U.S. Geological Survey, Department of the Interior/USGS, has a diagram showing how the molecules "stick" together and explains surface tension at http://ga.water.usgs.gov/edu/capillaryaction.html.
- U.S. Geological Survey, Department of the Interior/USGS, explains the attraction of water molecules for surface tension to occur at http://ga.water.usgs.gov/edu/dictionary.html#S.
- The Green lane ™, Environment Canada's World Wide Web Site, defines surface tension at http://www.ec.gc.ca/water/en/nature/prop/e_surf.htm.

Reviewed by Wisconsin 4-H Curriculum Team: July 2008.



TAPE A PIECE OF WAX PAPER ON TOP OF THE MAZE



WATER STRETCH