deSTEMber
SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH
PRESENTED BY: girlstart

Water Strider

Why can some insects skip across the top of a pond? Observe the power of surface tension as you construct a wire water strider and learn the physics of how these "magical" bugs walk on water!

TEKS:

SCI 2.10 A: The student is expected to observe, record, and compare how the physical characteristics and behaviors of animals help them meet their basic needs.
SCI 4.5 A: The student is expected to measure, compare, and contrast physical properties of matter, including mass, volume, states (solid, liquid, gas), temperature, magnetism, and the ability to sink or float.
SCI 5.5 A: The student is expected to classify matter based on measurable, testable, and observable physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating using water as a reference point), solubility in water, and the ability to conduct or insulate thermal energy or electric energy.

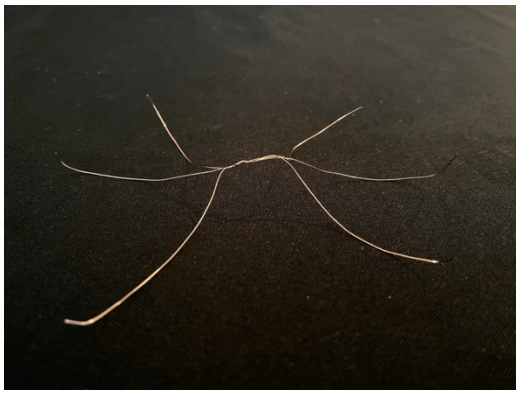
Materials:

- Bin or bowl
- Dish soap (1-2 drops; optional)
- Ruler
- Scissors or wire cutters
- Thin wire (non-insulated; 26-gauge or thinner works best)
- Water

How To:

1. Fill a bin or bowl about halfway with water.
2. Use scissors or a wire cutter to cut one two-inch piece of thin wire.
3. Place this piece of wire into the bowl of water and observe what happens.
4. Now let's build a water strider! First, cut three five-inch pieces of thin wire.
5. Line them up and twist the centers together tightly. The middle of the wires represents the water strider's body.

6. The six ends of wire represent the water strider's legs. Space the water strider's legs out evenly and form each leg into the shape of a very shallow "U." The wire water strider should be able to balance evenly on a flat surface.
7. Gently place the water strider into the bowl of water and observe what happens.
8. Optional: See what happens if you add one or two drops of dish soap into the bowl of water while your water strider is floating on top.



If your water strider does not float, try these troubleshooting tips:

- Make sure that all six of your water strider's legs touch the surface of the water at the same level. This helps make sure that the bug's weight is evenly distributed.
- Try to adjust the placement or shape of the wire legs. The more wire that touches the surface of the water, the better, so make sure that the ends of the legs only *slightly* curve upwards.

STEM Explanation:

What makes something sink or float? Normally, it has to do with the forces of gravity and buoyancy. The downward force of gravity and the upward force of buoyancy compete to either make an object float (when buoyancy is greater) or sink (when gravity is greater). This is what happened when you dropped the short, two-inch piece of wire into the bowl of water. The piece of wire had more gravity (the weight of the wire) than buoyancy (the weight of the water that the wire displaced) acting on it, causing the wire to sink. But why didn't *three* pieces of wire twisted together also sink? How did the water strider float?

If you look closely at your floating wire water strider, you might notice that instead of floating *in* the water like a boat, it is sitting *on top* of the water, without breaking through the surface. The water strider's floating power comes from something called surface tension. Surface tension is a unique property that liquids have that causes their surfaces to be strong. Molecules of water like to stick to each other, which causes the surface molecules to be more attracted to the water around them instead of the air. This causes the surface of the water to be tight, or have a thin "film" that is tricky for certain lightweight objects to break through. The more surface area an object has, the more that surface tension can act on it. This is why the single piece of wire sank, but the wire water strider floated. The wire insect had more surface area, and surface tension caused it to float! If you tried adding a drop or two of dish soap to the bowl, you probably found that your wire water strider sank almost immediately. This happened because soap is a surfactant, which is a type of substance that reduces the surface tension of a liquid.

Water striders in real life use the same surface tension properties to seemingly "magically" walk across bodies of water! They have lightweight bodies with very long legs covered in tiny hairs that repel water. Water striders are adapted to spend nearly their entire lives walking on water.

Career Connection:

Physicists study the natural world, from the tiniest subatomic particles to the largest galaxies. They do experiments to discover the laws of nature. They study what things are made of (matter) and how things behave. They also learn about energy, studying how it changes from one form to another.

Resources:

https://kids.kiddle.co/Surface_tension
https://www.sciencebuddies.org/stem-activities/build-a-water-strider#summary

Image Sources:
https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates/Water-Striders
https://blog.nature.org/science/2017/04/10/7-cool-facts-water-striders-skippers-pond-skaters-weird-nature/