

STEM Bites

TODAY'S INVESTIGATION: Water Drops on a Penny and Surface Tension

Grades 5-6

Overview: Students explore the surface tension properties of water.

NGSS:

5-PS1-3. Make observations and measurements to identify materials based on their properties.

Materials:

- Penny
- Eye dropper, pipette, or drinking straw
- Paper or cloth towels to wipe up spills
- Glass or cup of water
- Dish soap
- Optional: other coins, bottle caps, wax paper
- Optional: additional liquids such as vinegar, rubbing alcohol, hydrogen peroxide



Investigation:

1. Think about how some animals are able to move across the surface of the water and other things are able to float on the water. What is the phenomenon that allows that to occur? It is a property of water called "surface tension."
2. Watch this video to see an example of an animal walking on water: [Surface Tension](#)
3. To investigate surface tension, place the penny on a paper towel (or other surface to catch any water drops that might spill over).
4. Predict how many drops of water can be added to the penny before the water runs off.
5. Use the eyedropper to carefully drip water onto the penny, one drop at a time. Hold the dropper slightly above the water bubble without touching it.
6. Keep track of the number of drops. A sample data table is included on the last page.
7. Repeat the investigation five times to be sure you have an accurate test. The number of drops for each test can be calculated to find the mean (average).
8. Compare your results to the results of others. How similar were your numbers?
9. Add a teaspoon of dish soap to the cup of water and repeat the investigation. Will the penny hold more or fewer drops?



More Investigations:

1. Brainstorm a list of questions that could be asked about the number of water drops that can be placed on a penny. Think about the date of the penny, the side used for placing the drops, how clean or dirty the penny was, the size of the penny compared to other coins, and other questions that can be easily explored.
2. Drip water on other objects (bottle cap, etc.). How does a different surface affect the number of drops and the surface tension?
3. Explore the effect of using a needle to poke the water on the penny. If the water runs off, the surface tension has been broken.
4. Investigate the surface tension of other liquids such as rubbing alcohol or vinegar. How do they compare to water?
5. Investigate how the temperature of the water affects the surface tension.

Guiding Questions:

1. How do different variables, such as a clean or dirty coin, affect the outcome?
2. How does the shape of the water on the coin change as you add drops? What happens when you add the drop that finally breaks the surface tension?
3. Where else have you seen water taking on this shape?
4. What are some other properties of water that help identify it as water?
5. How do you think bugs, like water striders, are able to walk on the surface of water?
6. Different liquids have different surface tensions. When do you think a high surface tension or a low surface tension might be useful?

Product or Artifact Possibilities:

1. Create a data table with the results for five tests and the mean (average).
2. Create a bar graph with the results.
3. Draw a picture of the water beaded up on the penny with fresh water and soapy water.

What Are We Discovering?

Surface tension is one of the identifying properties of water. Water has a high surface tension because of the strong attraction of water molecules to one another. Surface tension is what allows insects, such as water striders, to walk on the surface of the water. Adding soap lowers the water's surface tension so the drop becomes weaker and breaks apart sooner. Other liquids such as rubbing alcohol have less surface tension.

Acknowledgments:

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Surface Tension Data Sheet

Drops of Tap Water on a Penny

Side of coin used:	Number of Drops
Trial #1	
Trial #2	
Trial #3	
Trial #4	
Trial #5	

Drops of Soapy Water on a Penny

Side of coin used:	Number of Drops
Trial #1	
Trial #2	
Trial #3	
Trial #4	
Trial #5	

Drops of Other Liquid on a Penny

Liquid:	Number of Drops
Trial #1	
Trial #2	
Trial #3	