

Surface Tension



SOCIAL-EMOTIONAL CONNECTION: Cohesion **GRADES:** 5th T **IME:** 90 Minutes

INSTRUCTOR EXPERIENCE: Beginner

OBJECTIVES: Students will explore the concept of surface tension and cohesion by determining the number of water drops that can fit on a penny.


ESSENTIAL QUESTION: How do molecular interactions at the surface of a liquid influence its capacity to support external forces?

MATERIALS:

- Book- Drops
- Surface Tension Guide
- Computer
- Projector
- Cups with water
- Pennies
- Dropper
- Paper towels
- Pencil

STANDARDS: [VA STEM](#)
[5.1a-f;5.2b](#)

SCIENTIFIC AND ENGINEERING PRACTICES:

 *5.2b: make observations to provide evidence that energy can be transferred from place to place through contact between objects*

Lesson delivery note: This lesson is designed to take approximately 90 minutes. Adapt the lesson to fit the amount of available time.

INSTRUCTIONS

1. Ask (5 minutes)

- Begin by posing the question, “When water comes into contact with a penny, how many

drops of water do you predict a penny can hold before it spills over?" Encourage students to make a prediction and a hypothesis and add it to their guide. Example of hypothesis: "If I add drops of water to a penny, then it will hold _____ drops without spilling over". Students will use their prediction in the hypothesis.

- Ask students why they believe the penny can hold that specific amount.
- Discuss the terms "surface tension" and "cohesion." What do they think these terms mean? Include the idea that water molecules may stick to a surface. Ask, how might water molecules sticking to the penny impact this experiment?

2. Research (15 minutes)

- Read the book titled, "Drops."
- Hold up the book and ask students to join you for a whole group read aloud.
- Can you list the different stages the water drop went through in the story?
- If you were the water drop, which part of the water cycle would you look forward to the most and why?
 - Why do you think cohesion would be important to a group or community?
 - Can you think of a time when you felt really connected to a group?
 - How can you work together (and cohesively) with others in school to make it a better place?

3. Connect to Careers (10 minutes)

What type of careers would it be important to understand the properties of liquid like surface tension?

- [What is Chemistry](#) video
- [Chemistry careers - A day in the work life of a chemist](#) video

4. Tinker to Discover (10 minutes)

1. Provide each student with a penny, a dropper, and a cup of water.
2. Instruct students to carefully place one drop of water at a time onto the penny and count the number of drops it can hold before the water spills over.
3. Encourage students to try different techniques like dropping the water from different heights or angles, to see if it makes a difference. Discuss any differences they observed and why they believe the changes happened.

5. Build a Prototype (15 minutes)

1. Challenge students to design a tool or method that maximizes the number of drops a penny can hold.
2. This could involve creating barriers around the penny or modifying the surface of the penny.

6. Test & Improve (25 minutes)

- Have students test their technique to see if they can replicate the number of drops of

water the penny holds.

- Have students share their results with their classmates. The most number of drops and the closest to their original hypothesis.

7. Discuss and Reflect (10 minutes)

- Reflect on their initial hypothesis compared to the actual outcomes.
- What surprised them? What did they learn about tension and cohesion?

EXTENSION ACTIVITIES

STEM TOOLKIT ACTIVITY

Surface Tension

- Try the experiment with other coins or surfaces.
- Experiment with adding soap or oil to the water to see how it affects the surface tension.
- Research other examples of surface tension in nature (e.g., certain insects walking on water).

