Materials Needed
- o Pennies plus other coins
- o Container for water
- o Dropper, small sponge, cotton ball, cotton swab or thin straw section
- o Tray, baking sheet or other flat surface to capture water
- o Paper towel
- o Data sheet or paper and pencil, to record results

Grade Range
3-5
6-8

Topics/Skills
Science: Surface Tension; Properties of Liquids (water)

Learning Standards
NGSS: Physical Science

Duration
10-30 minutes

Prep Time
10 minutes

Drops on a Penny

How Many Drops of Water Can a Penny Hold?

Make and test predictions to study the surprisingly strong surface tension of water.

Activity Challenge
Predict how many drops of water can be added to the top surface of a penny before the water spills off the edge.

Preparation
1. Place a penny on a tray with a small piece of paper towel under the penny. This will help to indicate when the water overflows.
2. Fill a dropper or wet a small sponge or cotton ball. These will be used to place water drops on the penny.
3. Get a pencil (or pen) and paper to record your predictions and results.

To Do
1. Predict how many drops of water you can drop onto the penny before the water overflows**.** Use the table on page 2 to record your prediction.
2. Using a dropper, sponge, cotton ball etc., carefully add water drops one at a time to the penny.
3. Count the number of drops as you add them until the water overflows. If you add drops close enough to one another so that they touch, the individual drops will merge into a larger drop. As you add drops of water, the drops will likely merge into one large drop before the water overflows the coin.
4. Repeat 3 to 4 times to collect data and calculate the average number of drops you can add before the water overflows the coin. Dry the coin after each attempt. Write the actual number below the predicted number.
5. Draw pictures of the shape of the water on the penny as more drops are added.

Data Table

Use the following table to record your observations.

Number of drops added	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
Predicted						
Actual						

Observations

- Compare results across trials. On average, how many drops can the coin hold? (Average = Sum of trials 1 to 5 divided by 5).
- Compare results and discuss variables that could affect the averages. For example, if there is a difference in the average number of drops held by a worn coin versus a new coin, the condition is one variable that can be discussed and possibly retested.

Extensions

- The dome of water creates a convex lens that magnifies the surface of the penny. Locate the tiny, seated Lincoln in the Lincoln Memorial on the penny's back.
- Repeat with new, worn, and different sized coins.
- Repeat the experiment with other coins of different metals. Compare surface tension of various liquids (e.g., oil, rubbing alcohol, juice).
- Repeat the experiment with soapy water. Observe and record the results.
- Fill a cup to the brim with water. Predict how many pennies can be put into the cup before it overflows. Test your predictions.
- Research the importance of surface tension in nature.

The Science Behind the Activity

Water molecules are attracted to other water molecules. This attraction is called **cohesive force** and is responsible for the phenomenon known as **surface tension,** typically measured in Newtons per meter (abbreviated N/m). Molecules at the surface lack water molecules on all sides, and therefore, cohere more strongly to the adjacent water molecules at the surface. This forms a "skin", or "film", at the surface. A sphere has the smallest surface area to volume ratio. The edges of the penny distort the spherical shape into a dome shape. Water exhibits higher surface tension than many other liquids.