MIND TREKKERS
Penny Droplets

Amount of time Demo takes: 1-3 minutes
Materials:
1. Handful of pennies (enough such that there’s drying time for the wet pennies while new dry pennies are used).
2. 2 eyedroppers per station (2-3 stations easily accommodated by one Trekker).
3. 2 glasses per station (one with clean and the other with soap water).
4. Dawn Dish Soap (on the order of Tbsp needed).
5. Paper towel

Set up instructions: Do this for each station.
1. Fill the two cups with water, and put ~1 Tbsp of dish soap in one and gently mix it in.
2. Each station should have:
   a. 1 clean water eye dropper
   b. 1 soap water eye dropper
   c. 1 clean water cup
   d. 1 soap water cup
   e. 2 pennies (to be changed out as needed)

SAFETY!
1. Safe demo

Lesson’s big idea
● Surface tension holds fluids together! The higher this tension, the larger the volume may be before the tension is broken. This is due to water’s cohesive properties - it sticks to itself.
● The water doesn’t slide off the penny because it adheres to the surface for as long as its own cohesive force can contain the volume of water atop the surface.

Background information
1. Vocabulary and Force Images
   a. cohesion - the sticking together of particles of the same substance
   b. adhesion - the sticking together of particles of differing substances
   c. surface tension - the force holding the outermost layer of a substance together due to the cohesive forces between the particles in the substance

Instructional Procedure
1. Tell students to try to put as many drops of clean water as possible on a penny, and have them do it a few times.
   Do note that the results will differ between wet and non-wet pennies. Have them record their data.
2. Repeat the first step, but with the soapy water.
3. The soapy water drops that they were able to get on a penny should be fewer than the number with clean water. This is because the soapy water mixture has a weaker surface tension than clean water, making the fluid flow off of the penny at a smaller volume than the clean water. (The soapy water’s surface can’t hold it back!)

Assessment, Sample questions you can ask:
1. Why do you think the surface tension of the soapy water is smaller? (Ans: the water on its own has the cohesive properties mentioned above. The soap particles get between the $H_2G$ molecules, making the force between the water weaker.)
2. Can you think of anywhere else that you’ve seen surface tension in action? (Ans: this could be a variety of things. A good example is when cooking pasta, many chefs will add a small amount of oil to break the surface tension of the boiling water such that the pot won’t boil over the side as easily.)

Clean Up
● Dry items before placing them in storage.

References
● Bill Nye

National K-12 Science Standards
● List by K-4, 5-8, 9-12 for each standard covered