Scientific Method Lab Activities: A Teacher's Guide

Lab #1: Drops of Water on a Penny (30 minutes, students in pairs)

Problem: How many drops of water can fit on a penny?

Research: (You'll have to adjust what you explain and what you have your students record according to their ability. Here is some background information…) The chemical formula for water is H_2O. There are 2 hydrogens for every one oxygen. The oxygen atom is much larger than the hydrogens. Water is a covalently bonded molecule, which means the atoms share their electrons. Because the oxygen is so much larger than the hydrogens, it 'hogs' the electrons. This makes the oxygen 'end' of the molecule slightly negatively charged. The hydrogen 'ends' are slightly positively charged. (The molecule as a whole is neutral.) Having positive and negative 'ends' makes water a polar molecule. The positive region on one molecule is attracted to the negative region on another. This makes water cohesive. Cohesive means 'sticks to itself.' In bodies of water large and small, water forms a 'skin' on the surface. This is strong enough for some insects to walk on! Water's cohesive ability also allows it to be pulled up through the vascular tissue of plants. Evapotranspiration occurs when water evaporates off of the leaf of a plant, causing a chain effect that leads to water being pulled up by the roots.

Hypothesis: Have students make a guess as to how many drops of water will fit on their penny. They may not do any experimenting before guessing. Given the background information, the size of the penny, and the size of the eyedropper, they should write down their educated guesses. Then make a class list on the board. After the class data is on the board, point out the highest and lowest guesses. Students should record these on their lab sheets. Example: My hypothesis: 10 drops; Class hypothesis: 2-15 drops.

Materials: Small cups or beakers of water, eyedroppers, pennies, paper towels, 1 lab sheet per student

Experiment: Now for the fun part! Each student is allowed 2-3 turns to drop as many drops as possible onto the penny. The drop that causes the water to 'spill over' does not count. Students should record their data on their lab sheet. After pairs have completed this and clean-up is complete, data should be compiled on the board. Point out the high and low numbers in the class for students to record on the lab sheet. (Analyze data)

Conclusion: Was the hypothesis correct? (It usually isn't) Discuss with the class what may have effected each group's experiments. (Height/angle of dropper, side of penny, strength of squeeze, time between drops, etc.)

Lab #2: Spring a Leak? (20 minutes, students in pairs)

Problem: Can you poke a hole through a plastic bag without it leaking? (Plastic sandwich bag, name-brand works best☺)

Research: Solids, liquids, gases, and plasma are the four states of matter. You have learned what defines each of these in the past. However, these are broad terms, and there are many variations. Plastics are a variation of a solid called an amorphous solid. Amorphous solids can go from solid to liquid over a range of temperatures. Glass is another example of an amorphous solid. This is why glass windows in very old houses are thicker at the bottom and thinner at the top. The 'behaviors' of amorphous solids are different than regular solids. For example, solids have a consistent shape and volume. Amorphous solids do not have a consistent shape.

Hypothesis: Explain to students that for the experiment they will be filling plastic sandwich bags about 2/3 full with water. Then they will take a sharp wooden pencil and poke it ALL the way through the bag (and water). They should hypothesize whether or not the bag will leak not at all, a little, or a lot. Have them do the experiment over a sink or bucket so they will think it will leak. It doesn't leak. I've put 15 pencils through the same baggies of water at once. It looks really cool. Take a class vote and have students record the class hypothesis.

Experiment: Have students poke pencils through the baggies over a sink, or outside. You can have a competition to see who can get the most through. You can also try pens or mechanical pencils to see what works. If it's nice out, consider doing this experiment outside!

Conclusion: Was your hypothesis correct? Was the class hypothesis correct? What are some things that may have affected the results? How could you add to the experiment?

Lab #3: Where the Green Grass Grows

Note on timing It is best to start this on a Friday. The most dramatic changes in the grass will fall on days 4, 5, 6, 7, 8. This project can take anywhere from 1-2 weeks. You want to spend about 10-15 minutes on it the first day, and then about 5-

10 minutes on which ever days you choose to check on your grass. You can see from my pictures in the "what to expect" section which days are most exciting.

Problem: Can grass grow without sunlight?

Research: Review what plants need in order to grow. What you will need to add: Plants are green because of chloroplasts, a cell organelle responsible for converting sunlight into energy. This organelle is green and uses the sun's energy to allow the plant to undergo photosynthesis. There is another organelle in plant cells that makes energy, mitochondria, which are NOT green. Discuss what happens to grass when you leave a kiddy pool out too long (it's not as green as the surrounding grass.)

Hypothesis: Will the grass grow if it doesn't have sunlight? If it does what will it look like? There will be a wide variety of answers. This is a great class discussion. Each student should record their hypothesis.

Materials: 2 pots, potting soil, grass seed, water and watering can, lab sheet, sunny spot on window sill, cabinet

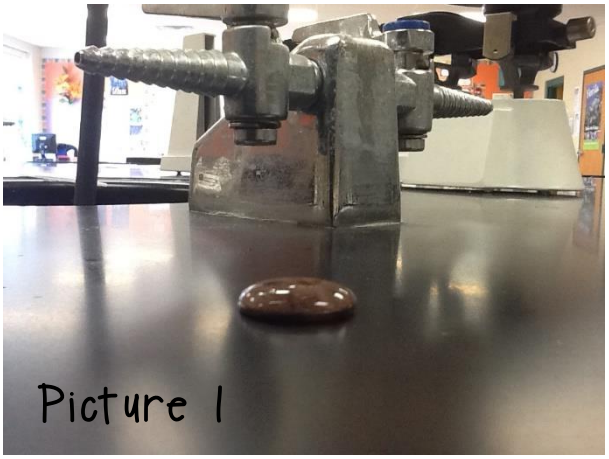
Experiment: Control pot should be given sunlight: Experimental pot should be placed in a cabinet where there is NO sunlight. You will need to keep soil moist, especially every day the first week, so the seeds can germinate and begin growing. See pictures for what to expect each day. Again: best to start on Friday as your day 1. This means that you, the teacher, will need to bring them home for the weekend, keeping one in the dark and one in the daylight and water them every day! By Monday you will begin to see differences in the two pots. By Wednesday your students will be anxious to get the class to see the difference! This is one of those experiments they'll go home and tell their parents about! So fun!

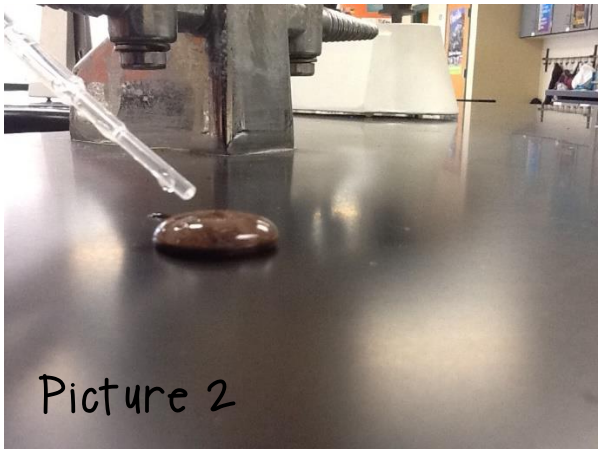
Conclusion: Was your hypothesis correct? Why do you think this happened?

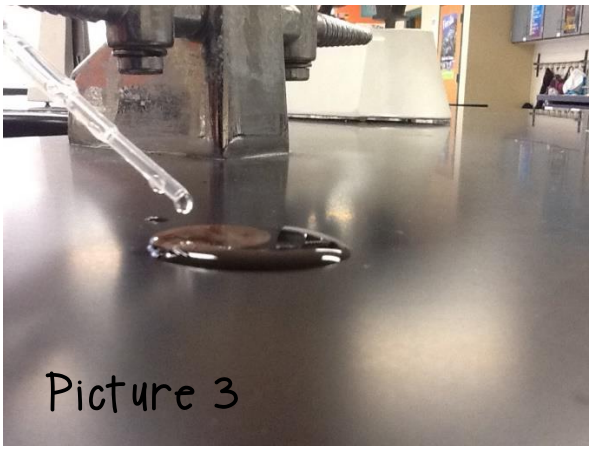
Extensions: Were there any other differences that you noticed? What can you attribute them to? What happens if you switch the pots? Maybe switch the pots for the second week?!

What to Expect: Here are some pictures to give you can idea of what these things will looks like.

Scientific Method #1: Drops of Water on a Penny





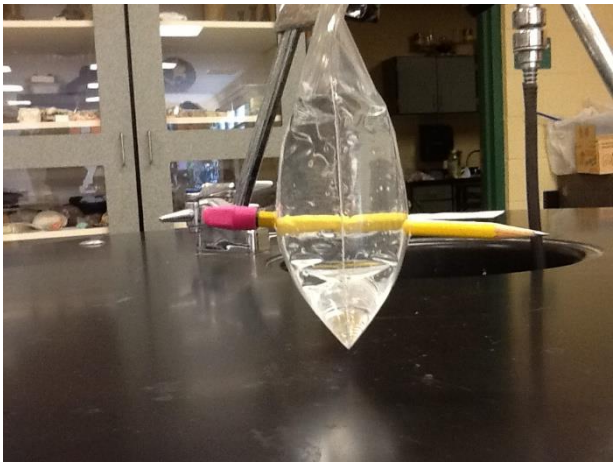


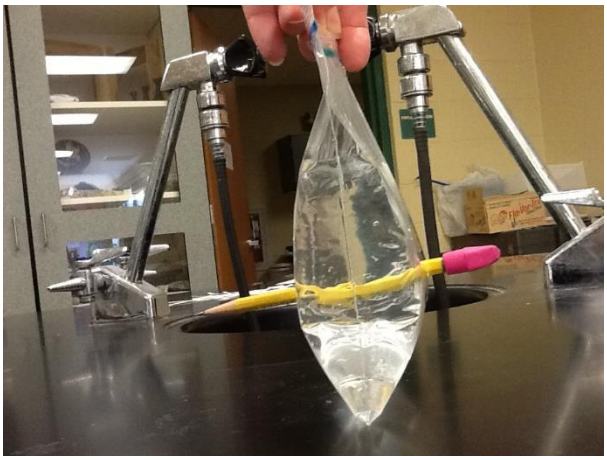
Picture 1: The bubble of water that forms on the penny.

Picture 2: The last drop before it runs over.

Picture 3: Burst my bubble!

Scientific Method #2: Spring a Leak? (Nope!)





Go ahead and try this one at home first and you'll be amazed. I always expect it to not work and it always works. I once had 15 pencils in one bag. This lab is so easy and the kids love it so much!

Scientific Method #3: Where the Green Grass Grows

Day 1: Plant the grass seed

Day 4:

Pot on RIGHT was in the DARK! The fact that it germinates more quickly and appears greener confuses the students. Do NOT switch the pots and do not mix them up. The grass in the light (left) is shorter and appears more of a red color (you can't tell in this photo.)

Day 5:

Light: Left Dark: Right

The grass that had sunlight is now turning green. Dark pot is taller and turning yellowish white.

Day 6:

Dark pot is obviously more of a yellow/white and taller. Light pot is shorter and greener.

Day 7: More of the same.

Day 8: What would happen if you switched them?

Name _____ Date _____

Scientific Method: Drops on a Penny

Problem: _____

Research:

_____

_____

Hypothesis:

I think _____ drops of water will fit on a penny.

The class thinks between _____ and _____ drops of water will fit on a penny.

Data:

	Trial 1	Trial 2	Trial 3
My data			
My lab partner			

The highest recorded number in the class was _____ drops.

The lowest recorded number in the class was _____ drops.

Conclusion:

Summarize what happened: _____

_____

Was your hypothesis correct? _____

Name one error in the experiment: _____

Name _____ Date _____

Scientific Method: Spring a Leak?

Problem: _____

Research:

_____

Hypothesis:

My hypothesis: _____

Class hypothesis: _____

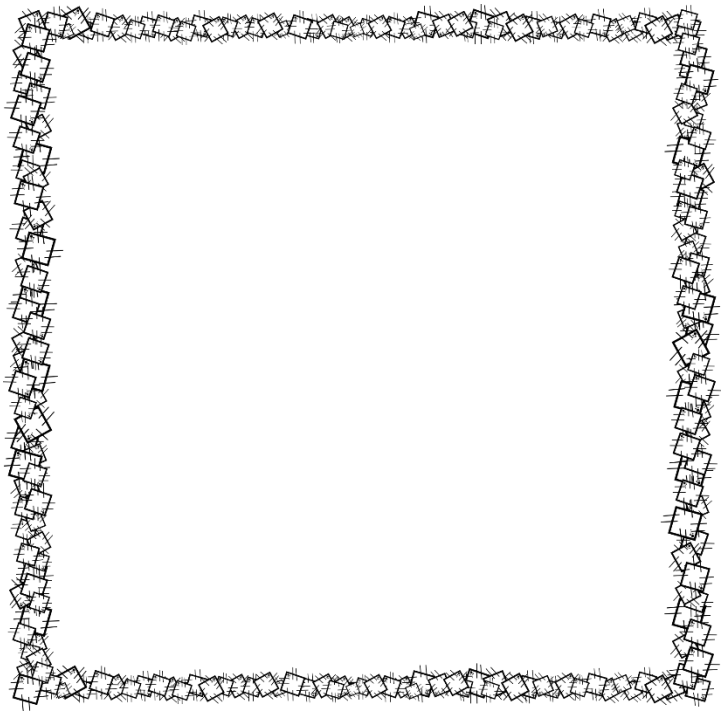
Experiment/What happened:

_____

_____

Conclusion:

Draw a picture.



Name _____ Date _____

Scientific Method: Where the Green Grass Grows

Problem: _____

Research:

_____

_____

Hypothesis:

My hypothesis: _____

Experiment/Data:

Date	Control Grass (sunlight)	Experimental Grass (dark)
	Drawing: Observations:	Drawing: Observations:
	Drawing: Observations:	Drawing: Observations:

	Drawing: Observations:	Drawing: Observations:
	Drawing: Observations:	Drawing: Observations:
	Drawing: Observations:	Drawing: Observations:

Conclusion:

Back to School Scientific Method Lab Activities

Drops on a Penny

Where the Green Grass Grows

Spring a Leak?

Thank you for your purchase!