I hope these bless you. **Please note, these are not typical science sheets.** SO I have written a summary to help you understand the purpose and intent behind the changes.

As someone who loves science, I've struggled with the value of this segment. It felt like it was squashing a square peg of VanCleaves into a round hole of the scientific method. At times it wouldn't fit well. Often we were asking kids to make a hypothesis and not really providing enough knowledge to help them make an educated guess. I don't want to model uninteresting, random or silly guesses. Science is as amazing as our Lord! The goal for this time is not to make the grammar student struggle being dialetic, but to model a dialetic process for them and spend the most time soaking them in the grammar stage of science experiments - observation.

To use an example from C2Q1: Why do satellites appear stationary? Many of our students wouldn't have a guess based on facts.

My regional manager shared her flow, which is to take the scientific method out of order; specifically moving the hypothesis to after discussing the materials and procedure. This enables our students to make a guess based on something tangible and in front of them…. what could actually happen in the experiment. This has really helped our students engage so much more during science and actually made my tutors' job easier.

So here's the flow:

1. Talk about the purpose and define the key vocabulary (grammar). (of course in a fun or story type of way)
2. Then say ~ let's see how we'll find out. Go over the materials and the procedure. Sometimes read through it or sometimes the tutor will begin the experiment.
3. RIGHT before completing the experiment ask the student to give their hypothesis on what will happen.
    a. Example for week 13 #161… Tutor reads through the procedure (or even begins the experiment) Then asks the student…. What do you think will be happen when we tap the spoon harshly? What will be different when we tap it softly? Or…. What do you think will happen when we tap the spoons at different firmnesses? Etc. This allows the student to really engage and make a hypothesis based on something tangible.
4. After making the hypothesis, complete the experiment and if time, allow for some hands-on additional experimentation. What happens if we bang it on the floor, wood, metal, plastic…. Etc.
5. Make time for the student's observations. Have them make notes or draw. It doesn't have to be full sentences or detailed pictures (although those could be nice). Teach them the value of a minute and to sketch/note quickly but with detail. Learning the value of a minute is a powerful opportunity CC presents that isn't always expected or available in the home or other co-ops.

6. Then at the conclusion, tie it back together with the purpose. Were we able to control the sound level? How did that work (if not discussed earlier).

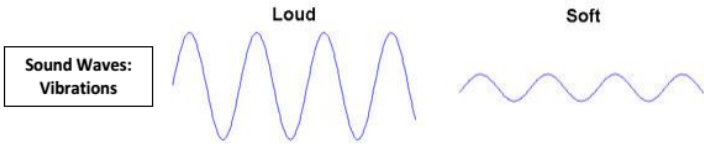
It is not the goal that the students would BE dialetic here, but that we would lead them through a dialetic process. Remember the grammar of science experiments (and so much of life) is observation. I encourage my tutors to spend the most time in this area. Helping the students observe with as many senses as they can. You can also ask students to close their eyes to direct their focus to their ears – etc.

May God bless you and your community!
Susan

If you have questions (or see any typos), feel free to email me at susanseiler@gmail.com

Science Experiment: Spoon Bell #161
Cycle 2, Week 13

What are we discovering? Vibrations and sound waves.
When things vibrate, they create sound waves. A larger vibration creates more energy, producing a larger sound wave and louder sound.



PURPOSE: Can we control if an object makes a loud or soft sound?

How we'll find out:

MATERIALS

☐ Metal Spoon ☐ 30 inches of string ☐ 2 plastic cups (optional)

PROCEDURE

- Tie the handle of the spoon at the mid point of the string.
- Wrap ends of the string around your index fingers. Be sure that both strings are the same length.
- Place the tips of your fingers in each ear or use plastic cups with the strings going inside the cup.
- Have someone tap the spoon harshly against the table. Then again, this time softly.

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ The spoon will sound different when tapped softly. (circle one) LOUDER QUIETER

☐ The spoon will sound the same both times.

Now, complete the experiment & see what happens!

OBSERVATION – *Write about or s*ketch what we're doing and what you observe.

CONCLUSION

Were you able to control the sound level? YES NO

Tapping the spoon HARD created a (**Louder** or **Softer**) sound which was caused by (**More** or **Less**) vibrations.

Tapping the spoon SOFTLY created a (**Louder** or **Softer**) sound which was caused by (**More** or **Less**) vibrations.

Science Experiment: Humming Glass #162
Cycle 2, Week 13

What are we discovering? Vibrations, sound and friction

PURPOSE: Can we make a glass vibrate enough it will make a sound?

Friction is a force that causes a moving object to slow down when it is touching another object.

How we'll find out:

MATERIALS

☐ Dish washing liquid ☐ Water ☐ Vinegar ☐ Container/Tub ☐Small bowl ☐Towel ☐Glass Stemware

PROCEDURE

- Use the dishwashing liquid to make a warm, soapy water solution in tub
- Wash your hands in the water and dry
- Place the glass on a table
- Pour a thin layer of vinegar into the small bowl
- Hold the base of the glass against the table with one hand
- Wet the index finger of your other hand with vinegar and gently rub your wet finger around the rim of the glass

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ Rubbing my finger on the rim of the glass will create vibrations and a sound

☐ Rubbing my finger on the rim of the glass will do nothing

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ Rubbing the glass rim created friction which caused vibrations and sound.

☐ Rubbing the glass rim _____

Science Experiment: Cold Foot #165
Cycle 2, Week 14

What are we discovering? Conductors of heat energy

PURPOSE: Which is a better conductor of heat energy: metal or fabric? Will your body heat move more easily through metal or fabric? Which one will feel colder?

How we'll find out:

MATERIALS

☐ Carpet ☐ Aluminum Foil ☐ Tile floor or other hard surface

PROCEDURE

- Cut a piece of foil that is a little bigger than your foot
- Place the foil and the rug on a tile floor. Allow them to remain undisturbed for 10 minutes
- Put one bare hand (or foot) on the aluminum foil and the other on the carpet
- Observe any difference between the feel of the temperature of the aluminum foil and that of the rug

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ The metal will feel **colder** than the carpet

☐ The metal will feel **warmer** than the carpet

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ Metal is a BETTER conductor of heat than carpet

☐ Metal is a WORSE conductor of heat than carpet

What happened? Things feel cold to the touch when heat energy is drawn away from your skin; things feel warm when heat energy is transferred to your skin. A heat **conductor** is a material that allows heat to move through it. The aluminum feels colder than the carpet because it is a good heat conductor and the heat leaves your foot and moves through the metal. The carpet is a poor heat conductor and actually blocks heat loss from your foot.

Science Experiment: Pepper Run #171
Cycle 2, Week 14

What are we discovering? Surface tension *and seeing something cool!*

PURPOSE: Can we make black pepper run across a bowl of water?

How we'll find out:

MATERIALS

☐ Water ☐ Bowl for water ☐ Pepper ☐ Dishwashing liquid ☐ Container for soap ☐ Toothpick

PROCEDURE

- Pour water into bowl
- Sprinkle pepper over surface of the water
- Take a **dry** toothpick and dip it into the center of the dish with the pepper – what happened?

- In a different container, pour a few drops of dish soap & dip the end of the toothpick into it.
- Touch the soap end of the toothpick into the middle of the pepper.

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

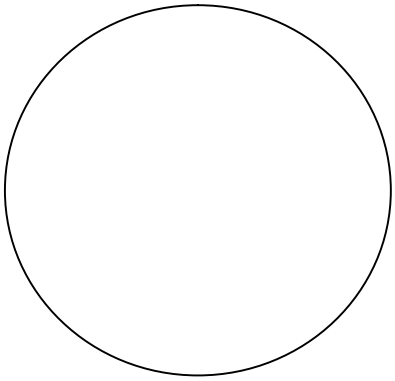
When the dry toothpick is dipped ☐ Pepper will "run" ☐ Nothing will happen

When the soap toothpick is dipped ☐ Pepper will "run" ☐ Nothing will happen

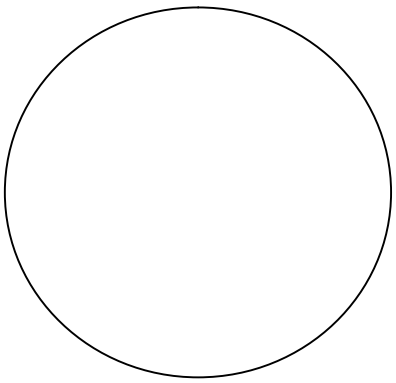
Now, complete the experiment & see what happens!

OBSERVATION – Sketch what we're doing and what you observe.

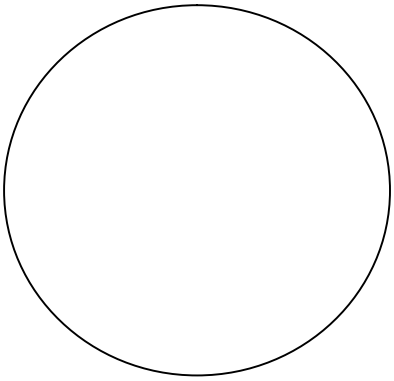
ADDED PEPPER



DRY TOOTHPICK



TOOTHPICK WITH SOAP



CONCLUSION

☐ A weakened surface tension caused the pepper to run

☐ The pepper didn't run at all

☐ _____

Science Experiment: Bottle Organ #164
Cycle 2, Week 15

What are we discovering? Frequency and pitch of sound waves

PURPOSE: Can the same materials make different sounds? Can we make the glasses vibrate differently in such a way that it will cause the sound to be higher or lower?

How we'll find out:

MATERIALS

☐ Water ☐ 6 Bottles or glasses of similar size ☐ Metal Spoon

PROCEDURE

- Pour different amounts of water in each bottle/glass
- Gently tap each bottle with the metal spoon
- Note the difference in the pitch produced

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ The glasses will all make the same sound.

☐ The glasses will make different sounds: (select one below)

☐ More water will create a lower pitch ☐ More water will create a higher pitch

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ More water causes the glass to vibrate less and the pitch is lower.

☐ More water causes the glass to vibrate more and the pitch is higher.

☐ No noticeable difference

Science Experiment: Shape Up #189
Cycle 2, Week 16

What are we discovering? Center of gravity and rolling speed

PURPOSE: Can the shape (structure) of an object affect its rolling speed?

How we'll find out:

MATERIALS

☐ Table ☐ 2 books of equal thickness ☐ 2 jar lids, same size ☐ 1 large roll masking tape ☐ marble ☐ masking tape ☐ helper ☐ yardstick (optional)

PROCEDURE

- Tilt the table by placing a book under the legs on one side
- Place the lid tops together and tape their edges to form a disk
- Ask your helper to hold the disk made from the lids at the top of the incline while you hold the marble and roll of tap in line with the desk.
- Release all three objects at once (You can use a yard stick to line up all the objects behind to help releasing them at the same time.)

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ The marble will roll the fastest
☐ The tape will roll the fastest
☐ The jar lids will roll the fastest

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION *(marble lids tape)*

1st Place: _____ because the weight was closest to its center of gravity

2nd Place: _____ because the weight was further away from its center of gravity

3rd Place: _____ because the weight was furthest away from its center of gravity

Science Experiment: Breakthrough #190
Cycle 2, Week 16

What are we discovering? Surface area and falling speed

PURPOSE: Can the shape of an object affect its falling speed?

How we'll find out:

MATERIALS

☐ 2 sheets of paper ☐ ruler ☐ scissors ☐ pencil ☐ drawing compass ☐ clear tape

PROCEDURE

- On both papers, draw a circle with an 8" diameter and cut out both circles.
- On one circle, cut a slit from the outside to the center.
- Overlap the cut edges to form a cone. Use a 1" piece of tape to secure the edges.
- Put an equal sized piece of tape in the center of the flat piece of paper to keep the weights equal.
- Hold the circle in one hand and the cone point side down in the other, at the same height.
- Observe as they fall and strike the floor

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ The cone will fall faster

☐ The circle will fall faster

☐ They will both fall the same

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ The cone landed first

☐ The circle landed first

☐ They both landed at the same time

Science Experiment: Energy Change #174
Cycle 2, Week 17

What are we discovering? Potential energy and kinetic energy

PURPOSE: Can height affect the energy of an object? If we raise the marble higher, will it move the cup differently when released?

Potential Energy *is stored energy*

Kinetic Energy *is energy in motion*

How we'll find out:

MATERIALS

☐ scissors ☐ 8oz paper cup ☐ ruler with center groove ☐ pencil ☐ marble ☐ book

PROCEDURE

- Cut a 1 ½" square section from the top of the paper cup
- Place the cup over the ruler. The end of the ruler should touch the back of the cup.

Test #1

- Raise the opposite end of the ruler and **rest it on the pencil**
- Place the marble in the center groove of the ruler at the ruler's highest end.
- Release the marble and observe the cup.

Test #2

- Raise the end of the ruler and **rest it on the edge of the book.**
- Again, position the marble in the groove at the ruler's highest end.
- Release the marble and observe the cup.

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ Rolling the marble **from the book** will have greater energy

☐ Rolling the marble **from the pencil** will have greater energy

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ The higher the object, the more potential energy it has.

☐ The height of an object has no affect on its potential or kinetic energy.

Science Experiment: Snap! #177
Cycle 2, Week 17

What are we discovering? Inertia! This is the resistance an object has to a change in its state of motion. Newton's first law of motion is often referred to as the Law of Inertia.

Newton's First Law of Motion
"An object at rest tends to remain at rest, and an object in motion tends to continue moving in a straight line at constant speed unless an outside force acts upon it."

PURPOSE: Can an object remain stationary even while sitting upon a moving object? What will happen to the can when the paper is slipped out from under it?

How we'll find out:

MATERIALS

☐ Scissors ☐ ruler ☐ paper ☐ closed can of soda

PROCEDURE

- Cut a 4" x 10" strip of paper
- Lay the paper strip on a clean, dry table
- Place the soda can over one end of the paper. (BE SURE THE BOTTOM OF CAN IS CLEAN & DRY)
- Hold the other end of the paper and push it close to the can.
- Quickly snap the paper away from the can in a straight line.

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ The can will go flying! (or otherwise topple over)

☐ The can will stay in place

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ The can remained upright and in the same place

☐ The can moved significantly

☐ _____

Science Experiment: Ramp #185
Cycle 2, Week 18

What are we discovering? A simple machine called an incline plane. It is a ramp which can make it easier to lift or lower things.

PURPOSE: Can an incline plane reduce the amount of force we use to move something up or down heights?

How we'll find out:

MATERIALS

☐ scissors ☐ pencil ☐ ruler ☐ tape ☐ paper

PROCEDURE

- Cut a 5" square from the paper.
- Draw a diagonal line across the square and cut across the line.
- Color the longest edge of the paper triangle with the pencil.
- Tape the triangle to the pencil as shown in the diagram.
- Wind the paper onto the pencil.

HYPOTHESIS - ***My guess on what takes less effort:*** ☐ I don't know

☐ Going straight up the side of the pencil

☐ Using a straight ramp to get to the top

☐ Using a ramp wrapped around the pencil

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ An incline plane makes our work easier (we use less effort). It is an effective way to reduce the amount of force needed to move an object.

☐ An incline plane makes no difference in the force we expend.

Thinking deeper: How do you think friction plays a role in the amount of work needed to move an object? How do you think the angle of the slope plays a role in the amount of work needed to move an object? Is there anything besides friction or slope angle that may change the amount of force needed to move an object?

Science Experiment: Lifter #184
Cycle 2, Week 18

What are we discovering? Simple machines: Incline planes & Screws

PURPOSE: How does a screw work? Can we use rotational force (torque) to create linear motion? In other words, can rotating (turning) the screw move it up or down? If so how?

How we'll find out:

MATERIALS

☐ large screw

PROCEDURE

- Hold the head of the screw with one hand
- Put two fingernails on the first ridge at the tip of the screw
- Turn the head of the screw clockwise

HYPOTHESIS - ***My guess on what will happen:*** ☐ I don't know

☐ As the screw turns, my fingers will remain on the first ridge

☐ As the screw turns, the ridges will travel up or down under my fingers

Now, complete the experiment & see what happens!

OBSERVATION – Write about or sketch what we're doing and what you observe.

CONCLUSION

☐ A screw works by using an incline plane, wrapped upwards around its center, to convert rotational motion into linear motion.

In other words: A screw works by using a ramp, wrapped upwards around its center, to move itself up and down with only a turning motion.