Science Log

INSTRUCTIONS

Hello! This science log is meant to explain a variety of science concepts through hands-on experiments. This was part of a 2018 Summer Fun class for children in grades 2-3, but you could use it for students in grades lower and higher. Adapt as needed!

Each experiment's log is based on the scientific method. We have included an explanation of what that is, as well as an example of how to work through each step. The scientific method starts with an observation and based on that observation, you ask a question. We have skipped the observation step for the purposes of this science log.

Under the title of each experiment, there is a Question. You will fill out the Hypothesis and Predications sections of each log based on that Question. Next you will follow the step by step instruction for each experiment and record your Results in your log. The scientific method is on each log for reference.

If you have any additional questions, feel free to reach out to Russanne Hoff, Curator of Education, at rhoff@hastingsmuseum.org.

What grows best?

Materials

Clear cups (3 per person)

Bean seeds (6 per person)

Paper towels

Droppers

Marker

Water

Instructions

Note: Start this project on a Monday and record results for the remainder of the week.

1. Discuss what plants need in order to grow.
2. Fill out the Hypothesis and Predictions sections in the "What Grows Best?" log.
3. Put a paper towel at the bottom of each cup.
4. Place two bean seeds in each cup.
5. Label the three cups: sun with water, sun with no water, no sun with water.
6. Place the two sun cups near a window.
7. Place the no sun cup in a dark, sunless area.
8. Water the cups each day.
9. Record results each day of the week on the "Record Plant Growth" page in your science log, making notes on the lines and drawing what you see in each box.

The Science

Plants use the sun's energy to make their own food energy in their leaves as part of the photosynthesis process. If plants don't get enough sun, they won't be able to photosynthesize and release oxygen. Too much sun can be damaging because it can dry out the plant. Water helps plants move nutrients from the soil up through their stems and leaves. Water also keeps the plant moist, flexible, and helps it make its own food.

What grows best?

Question: What do seeds need to grow?

Hypothesis:

PREDICTIONS

	Rank which will grow best.
Sun with Water	
Sun with No Water	
No Sun with Water	

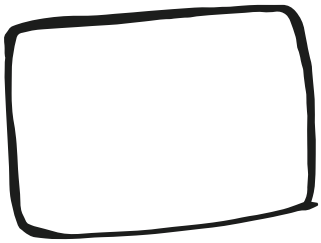
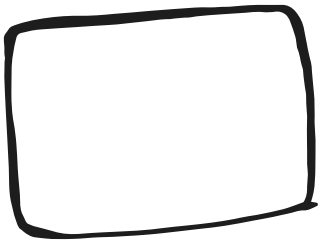
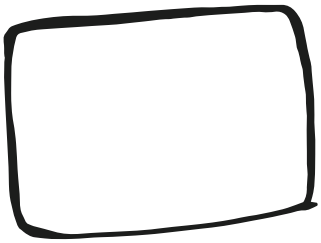
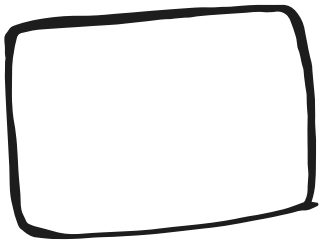
RESULTS

	Rank which grew best.
Sun with Water	
Sun with No Water	
No Sun with Water	

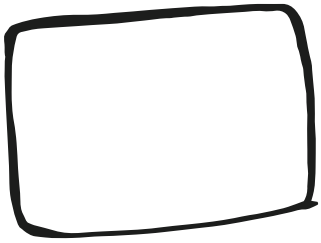
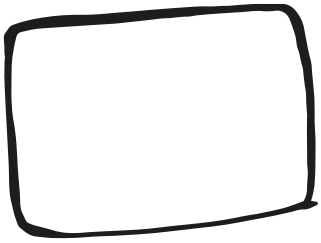
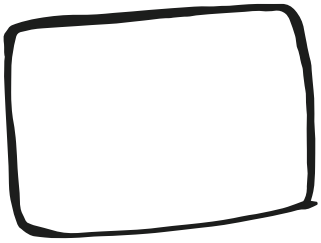
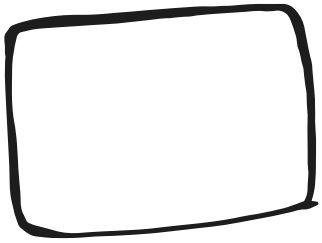
5 Steps of the Scientific Method:

1. Make an observation.
2. Ask a question.
3. Form a hypothesis (a potential answer to the question that can somehow be tested). This hypothesis may not be the right explanation. It's just a possible explanation that can be tested to see if it is correct. In other words, it happened because . . .
4. Make a prediction (an outcome we would expect to see if the hypothesis is correct). In other words, if I *BLANK*, then *BLANK* will happen . . .
5. Test the hypothesis by making an observation or doing an experiment.
6. Share your results

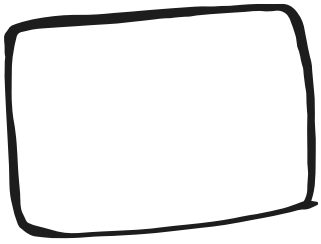
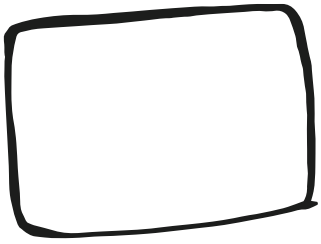
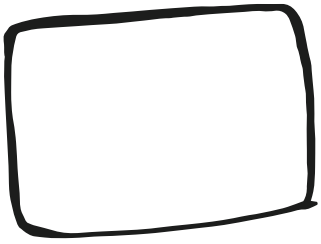
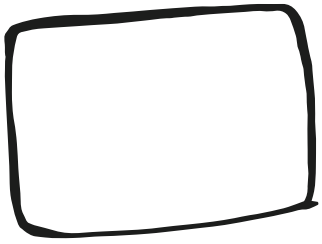
Record Plant Growth

TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
			

Sun With Water

TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
			

Sun With No Water

TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
			

No Sun With Water

Separating Inks

Materials

Paper towels

Watercolor markers

Newspaper, wax paper, or parchment paper

Water

Bowls

Instructions

1. Discuss primary and secondary colors. It might be helpful to find a color wheel online for reference.
2. Fill out the Hypothesis and Predictions sections in the "Separating Inks" log.
3. Pick the colors you want to test.
4. Draw a line across the width of the paper towel. Repeat for each color you are testing. Use a different paper towel for each color.
5. Dip the paper towel into the bowl of water, making sure the pen line you just drew stays above the water. Hold the paper towel in the water for one minute.
6. Put the paper towel on the newspaper, wax paper, or parchment paper to dry. Watch what happens and record your results.

The Science

Ink is usually a mixture of multiple colors. When the water soaks up in the paper and touches the ink, the ink dissolves, spreading out and separating into different colors. This is called chromatography. How fast each pigment travels up the paper depends on the size of the pigment molecule and how strongly the pigment is attracted to the paper. Since the water carries the different pigments at different rates, the ink separates to reveal the colors that were mixed to make it.

Separating Inks

Question: If you draw a line on the paper towel and dip it into water, what will happen?

Hypothesis:

Prediction: Color #1 _____ **will separate into** _____.

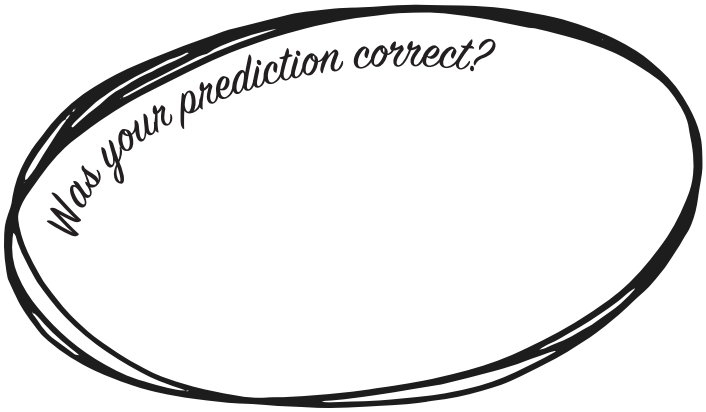
Results: What colors did it separate into?

Prediction: Color #2 _____ **will separate into** _____.

Results: What colors did it separate into?

Prediction: Color #3 _____ **will separate into** _____.

Results: What colors did it separate into?



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5. Test the hypothesis by making an observation or doing an experiment.
6. Share your results

Balloon Rocket

Materials

Long balloons

Straws

String

Tape

Two chairs (dining room chairs work well)

Scissors

Binder clip, clothespin, or paper clip

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Balloon Rocket" log.
2. Cut a piece of string about 10 feet long. Tie one end to one of the chairs.
3. Thread the straw onto the piece of string. Tie the other end of the string to the other chair. Push the chairs apart so the string is tight.
4. Blow the balloon up and clip the neck shut (do not tie the balloon).
5. Tape the balloon to the straw.
6. Push the balloon to one end of the string with the neck facing the chair.
7. Take the clip off. What happens? Record your results.

The Science

A force is a push or pull that acts upon an object as a result of its interaction with another object. Forces results from interactions. When objects interact with each other, they exert forces upon each other. For example, when you sit in a chair, your body exerts a downward force on the chair and the chair exerts an upward force on your body. These two forces are called action and reaction forces and are Newton's Third Law of Motion: For every action, there is an equal and opposite reaction. The size of the forces on the first object equals the size of the forces on the second object. The direction on the first object is opposite to the direction of the force on the second object. Forces always come in pairs-equal and opposite action-reaction force pairs.

Balloon Rocket

Question: What will happen if you attach an inflated balloon to a string and release the air?

Hypothesis:

Prediction:

Test your hypothesis!

Results:

Was your prediction correct?

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Cooking with the Sun

Materials

Marshmallows

Foil

Bowl

Straw

Clear plastic wrap

Twist tie or rubber band

Scissors

Towel to prop bowl

Chocolate chips (optional)

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Cooking with the Sun" log.

2. Line your bowl with foil and make sure it's fully covered. Smooth out the wrinkles. Make sure to wrap the foil around the edge of the bowl.

3. Skewer the marshmallows with the straw. Lay the straw in the bowl so the marshmallows don't touch the foil. You may have to cut the straw.

4. Cover the bowl with clear plastic wrap, tying it underneath the bowl.

5. Set the bowl facing the sun so that it shines on the entire inside. You may need to use a towel to prop it up.

6. Check back every 15 to 30 minutes. Once the marshmallow is soft, it's ready to eat. If using the chocolate chips, they should be melted by the time the marshmallow is ready. You can dip the marshmallow in the chocolate for extra yumminess. Keep track of your time because you'll need to record it.

7. Compare the taste of a marshmallow out of the bag to your cooked one. Record your results.

The Science

When wind blows over a kite and you pull the string, it creates a force called lift. This force make the kite rise in the air. Adding a tail makes the kite fly more smoothly. It gives it extra weight and helps balance the kite so it doesn't twist and turn as much in the wind.

Cooking with the Sun

Question: If you put a marshmallow in a foil-lined bowl under plastic wrap and leave it in the sun, what will happen?

Hypothesis:

Prediction:

Results: How long did it take for your marshmallow to react?

Results: How did the sun marshmallow differ in taste from a marshmallow right out of the bag?

Was your prediction correct?

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5. Test the hypothesis by making an observation or doing an experiment.
6. Share your results

Flying Kites

Materials

Plastic bag

Marker

Scissors

Masking tape

Sticks

Kite string

Newspaper

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Flying Kites" log.
2. Make a cross out of the two sticks. Secure them together with string.
3. Place the kite frame on the plastic bag. Draw a diamond shape on the bag.
4. Cut the diamond out of the plastic bag and tape it to the frame. Cut out only one side of the bag.
5. Tape the diamond to the frame.
6. Turn your kite over and use something sharp to make a hole in the plastic where the sticks cross.
7. Thread the string through the hole and tie it to the frame. This will be the string you use to fly your kite.
8. Now you're ready to go outside and fly it.
9. Once you've flown your kite without the tail, make a long tail from newspapers (you may have to tape together several pieces). Once you have made your tail, tape it to your kite.
10. Go back outside and fly your kite with the tail. Record your observations about how the kite flew differently with and without the tail.

The Science

When wind blows over a kite and you pull the string, it creates a force called lift. This force make the kite rise in the air. Adding a tail makes the kite fly more smoothly. It gives it extra weight and helps balance the kite so it doesn't twist and turn as much in the wind.

Flying Kites

Question: Will a kite fly better with or without a tail?

Hypothesis:

Prediction:

- ◯ **The kite will fly better with the tail.**
- ◯ **The kite will fly better without the tail.**

Results: How did the kite fly differently with the tail than without?

Was your hypothesis correct?

5 Steps of the Scientific Method:

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5. Test the hypothesis by making an observation or doing an experiment.
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Layered Liquids

Materials

5 clear jar-like container*	Canola oil	Dish soap	Rubbing alcohol***
Tablespoon	Honey	Whole milk	Olive oil
Water**	Maple syrup	Corn syrup	

*You can use three jars and dump out and wash two of them to do the Beaker #4 and Beaker #5 layers.

**Add food coloring to the water so you can more easily see it in the jar.

***Add food coloring to the rubbing alcohol so you can more easily see it in the jar.

Instructions

1. Fill out the Hypothesis section in the "Layered Liquid" log.
2. Fill out the Prediction column in the Beakers #1, #2, and #3 boxes.
3. In one jar, put 4 tablespoons of each liquid listed in the Beaker #1 box.
4. Record which liquid sank to the bottom, stayed in the middle, and rose to the top.
5. In the other two jars, repeat for Beakers #2 and #3. Record which liquids sank to the bottom, stayed in the middle, and rose to the top.
6. If you aren't using five jars, dump the used ones out, and wash and dry thoroughly.
7. In the Beaker #4 box, list the three heaviest liquids in the left column from Beakers
#1, #2, and #3. The heaviest liquids are the ones that sank to the bottom in the other jars.
8. In the Predictions column in the Beaker #4 box, guess which liquid will sink to the bottom, stay in the middle, and rise to the top.
9. In a clean jar, pour 4 tablespoons of each of the liquids you listed in the Beaker #4 box.
10. In the Beaker #4 box, record which liquid sank to the bottom, stayed in the middle, and rose to the top.
11. In the Beaker #5 box, list the three lightest liquids in the left column from Beakers
#1, #2, and #3. The lightest liquids are the ones that rose to the top in the other jars.
12. In the Predictions column in the Beaker #5 box, guess which liquid will sink to the bottom, stay in the middle, and rise to the top.
13. In a clean jar, pour 4 tablespoons of each of the liquids you listed in the Beaker #5 box.
14. In the Beaker #5 box, record which liquid sank to the bottom, stayed in the middle, and rose to the top.
15. After you've completed layering all the liquids in each jar and recording your results, write down if your predictions were correct in the bottom left oval of the log.

The Science

Density is basically how much "stuff" is packed into a particular volume. Lighter liquids (like water or vegetable oil) are less dense than heavier liquids (like honey or corn syrup) so they float on top of the heavier liquids. The same amount of two different liquids you used in the container will have different densities because they have different masses. The liquids that weigh more (a higher density) will sink below the liquids that weigh less (a lower density).

Oil and water don't mix because oil is a slippery liquid that burns and is not soluble in water, meaning it doesn't dissolve. Water molecules are polar-they have a positive charge on one end and a negative charge on the other. Oil molecules are non-polar, meaning they have no charge. Because of this, oil molecules are more attracted to each other and not attracted to water molecules and vice versa. Also, water molecules are more densely packed than oil molecules.

Layered Liquids

Question: If you pour liquids with different densities into one container, which ones will sink to the bottom, stay in the middle, and float to the top?

Hypothesis:

Test your hypothesis!

Were your predictions correct?

Beaker #1

	Prediction	Bottom	Middle	Top
Corn Syrup				
Dish Soap				
Honey				

Beaker #2

	Prediction	Bottom	Middle	Top
Maple Syrup				
Olive Oil				
Rubbing Alcohol				

Beaker #3

	Prediction	Bottom	Middle	Top
Canola Oil				
Water				
Whole Milk				

Beaker #4 - Top 3 Heaviest

	Prediction	Bottom	Middle	Top

Beaker #5 - Top 3 Lightest

	Prediction	Bottom	Middle	Top

Sandwich Bag Bomb

Materials

Timer

Sandwich bag

Paper towel

Baking soda (1 ½ tablespoons)

Vinegar (1/2 cup vinegar)

Warm water (1/4 cup)

Glitter (optional)

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Sandwich Bag Bomb" log.
2. Tear the paper towel into a square that is about 6 x 6 inches.
3. Pour baking soda into the paper towel and fold it into an envelope.
4. Pour the vinegar and warm water into the bag. If you want to add a little sparkle, put the glitter in now.
5. Add the paper towel envelope of baking soda to the bag and seal it. Do this quickly!
6. Shake the bag a little, then put it on the ground and stand back to watch what happens.
7. Record your results on your log.
8. Repeat Steps 2-6. Time how long it takes for your bag to react. Record your results on your log.

The Science

Combining vinegar and baking soda produces carbon dioxide in equal portions as a result. The carbon dioxide soon fills the bag, and after straining the bag's seams, it pops with a bang. They react with each other because of an acid-based reaction. Vinegar is made with water, salt, and acetic acid. Baking soda contains sodium bicarbonate, which causes fizzing and bubbling when mixed with acid.

Sandwich Bag Bomb

Question: If you combine vinegar, water, glitter, and baking soda in a sandwich bag, what will happen?

Hypothesis:

Prediction:

Test your hypothesis!

Results: What happened?

Results: How long did it take your second bag to react?

Was your prediction correct?

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4. Make a prediction (an outcome we would expect to see if the hypothesis is correct). In other words, if I *BLANK*, then *BLANK* will happen…
5. Test the hypothesis by making an observation or doing an experiment.
6. Share your results

Sharpie Tiles

Materials

Timer

Sandwich bag

Paper towel

Baking soda (1 ½ tablespoons)

Vinegar (1/2 cup vinegar)

Warm water (1/4 cup)

Glitter (optional)

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Sharpie Tiles" log.

2. With Sharpies, color the ceramic tile in whatever design you would like. You can use as many colors as you wish.

3. Put a few drops of rubbing alcohol on the tile after you have colored it. Watch what happens. Record your results on your log.

The Science

Sharpie markers contain permanent ink, which doesn't wash away with water. However, the molecules in the ink are soluble in another solvent-rubbing alcohol. The solvent carries the different colors of ink with it as it spreads out.

Sharpie Tiles

Question:
If you drop rubbing alcohol onto Sharpie ink, what will happen?

Hypothesis:

Prediction:

Test your hypothesis!

Results:

Was your prediction correct?

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5. Test the hypothesis by making an observation or doing an experiment.
6. Share your results

Sock Bubbles

Materials

Plastic bottle

Sock

Scissors or knife

Food coloring

Bubbles

Bowls

Watercolor paper (optional)

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Sock Bubbles" log.

2. Make colored bubbles by adding food coloring to the different bowls of bubbles.

3. Cut off the end of a plastic bottle.

4. Stretch an old sock over the cut off end of your bottle.

5. Dip the sock end into the bubble mixture and blow through the bottle. Record what happens on your log.

6. If you would like to make this into an art project, blow the bubbles onto watercolor or construction paper and let it dry.

The Science

As you blow, the bubble mix passes through lots of tiny holes in the sock, making colorful bubbles that cling to each other. As the bubbles burst, they leave bubble shaped patterns on the dye of the paper.

Sock Bubbles

Question: If you blow through a bottle with a sock attached to it that has been dipped into bubble mixture, what will happen?

Hypothesis:

Prediction:

Results:

Was your prediction correct?

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Parachutes

Materials

Clothespins
String
Masking tape
Scissors
Hole punch
Pencils
Timer
Plastic bags
Paper
Marker
Bowl smaller than your plastic bag and fabric piece

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Parachutes" log.

2. You are going to make all of your parachutes first. For the plastic circle, place your bowl face down on top of you plastic bag. Trace a circle with your marker. Cut it out and set it aside.

3. Cut out two squares the same size from your piece of paper. Set one aside. For the other, punch some holes in it. Set it aside.

4. For your fabric parachute, you can make it a circle or square. If you make it a circle, use the same bowl you used in Step 2.

5. Tape 4 equal pieces of string to each corner of your parachutes. You may need to tie the string onto the fabric parachute. Try to keep all the string pieces about the same length.

6. Attach a clothespin to each parachute.

7. Find a tall spot to drop all of your parachutes from. You will need to have somebody time each drop. Record your results on your log.

8. For the parachute with no clothespin, remove it from one of the parachutes you already made and drop it from the same spot as before. Record your results.

The Science

As the parachute falls, it spreads out and traps air underneath it. This air pushes up against the parachute from below, creating a force known as air resistance. This slows the fall of the parachute.

Parachutes

Question: If you drop 4 parachutes made of different materials from the same high point, will they all fall at the same speed?

Hypothesis:

Prediction: _____ parachute will fall the slowest.

Prediction: _____ parachute will fall the fastest.

Material	Fall Time
Plastic Circle	
Paper Square	
Paper Square w/ Holes	
Fabric	
Your choice w/ no clothespin	

Test your hypothesis!

Results: Did your parachute fall differently without the clothespin? How?

Was your prediction correct?

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Kaleidoscope

Materials

Foil

Cardstock or other heavy paper

Glue stick

Tissue paper

Scissors

Tracing paper

Pencil

Tape

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Kaleidoscope" log.

2. Glue foil to one side of your cardstock.

3. Fold it in threes lengthwise, taping it together to make a 3D triangle.

4. Cut out a circle big enough to cover the end of the triangle. Make a hole in the middle of it with a pencil. Fold the sides over and tape it in place.

5. Cut two circles of tracing paper the same size. Sprinkle sequins or glitter on one side and tap them together. Take them over the other end of the tube.

6. Put your eye through the hole. Face the window and turn the tube. What do you see? Record your results.

7. For extra fun, try using different light sources and see how the reflection changes.

The Science

Light bouncing off shiny things is called reflection. As rays of light enter the tube, they bounce off the shiny sequins and off the shiny foil to create lots of colorful reflection patterns.

Kaleidoscope

Question: Can you make a repeating pattern using light?

Hypothesis:

Prediction:

- ◯ **Yes**
- ◯ **No**

Test your hypothesis!

Results: What else was needed to create the pattern?

Was your prediction correct?

5 Steps of the Scientific Method:

1. Make an observation.
2. Ask a question.
3. Form a hypothesis (a potential answer to the question that can somehow be tested). This hypothesis may not be the right explanation. It's just a possible explanation that can be tested to see if it is correct. In other words, it happened because . . .
4. Make a prediction (an outcome we would expect to see if the hypothesis is correct). In other words, if I *BLANK*, then *BLANK* will happen . . .
5. Test the hypothesis by making an observation or doing an experiment.
6. Share your results

Crafty Colors

Materials

Multiple colors and sheets of cellophane (red, blue, orange, pink, yellow, purple, green)

White paper

Crayons

Instructions

1. Fill out the Hypothesis and Predictions sections in the "Kaleidoscope" log.

2. Write the name of each crayon color on your piece of paper. You can write all the names on one piece. Press kind of hard.

3. Put each piece of cellophane paper over the white piece of paper. What crayon color does each cellophane color block? Do you need more than one log to block a color? Layer the same color of cellophane onto your white piece of paper and see if it takes multiple logs to block one color.

4. Record your results for each cellophane color on your log.

The Science

When light strikes a piece of paper it will absorb some of the rainbow colors and reflect others. For instance, the red crayon absorbs all of the colors and reflects only the red. The white paper absorbs none of the colors and reflects all of them. All the colors of the rainbow combine to form white. The red paper acts as a filter. It allows some colors to pass through and others to be blocked. This makes it appear as if the red lines have disappeared. The red filter blocks out all of the colors from the white paper, allowing only red through. The paper and the letters are now both red appearing, making the red lines disappear.

Crafty Colors

Question: What happens when you cover a drawing with colored sheets of cellophane?

Hypothesis:

PREDICTIONS

COLOR SHEET	BLOCKS	HOW MANY SHEETS
RED		
BLUE		
ORANGE		
PINK		
YELLOW		
PURPLE		
GREEN		

RESULTS

COLOR SHEET	BLOCKS	HOW MANY SHEETS
RED		
BLUE		
ORANGE		
PINK		
YELLOW		
PURPLE		
GREEN		

5 Steps of the Scientific Method:

1. Make an observation.
2. Ask a question.
3. Form a hypothesis (a potential answer to the question that can somehow be tested). This hypothesis may not be the right explanation. It's just a possible explanation that can be tested to see if it is correct. In other words, it happened because…
4. Make a prediction (an outcome we would expect to see if the hypothesis is correct). In other words, if I *BLANK*, then *BLANK* will happen…
5. Test the hypothesis by making an observation or doing an experiment.
6. Share your results