Virtual Camp Unit Guide for Light/Shadow/Air/Wind
(Classroom Portfolio Section 2.A.10, 3.G.14)

Carnegie Mellon Children’s School
Theme Leader(s): Donna Perovich
Estimated Timing: 4 weeks July 2021

• Key Conceptual Focus & Vocabulary

Topic Area
  2.G.02b Earth Science (earth & sky, seasons, weather, etc.)
  2.G.02c Physical Science (structures & properties of materials)

Vocabulary
  Scientific Terminology 2.G.08
  General Vocabulary Development Opportunities 2.D.04

A) Central Concepts to Learn

Central Concepts for Light/Shadow/Air/Wind Unit

Light:
  o A light source is anything that makes light, whether natural or artificial.
  o Earth’s natural light comes from our closet star, the sun.
  o The sun provides us with light, heat and energy.
  o The sun’s energy brings life to planet Earth.
  o Light energy from the sun can be converted to heat energy.
  o Fire is a natural source of light and heat.
  o Lamps, televisions, flashlights are examples of artificial light sources.
  o Light travels in a straight line.
  o Light can bend.
  o Many objects reflect or bounce light from a light source, such as the moon, mirrors or metal.

Shadow:
  o Objects can be transparent (light passes through and objects are clearly seen), translucent (light passes through but objects are not clear), opaque (no light passes through).
  o A shadow is formed when an opaque object is placed in the path of light rays.
  o The dark region where light cannot reach is called a shadow.
- Not all objects cast a shadow.
- Your shadow is longest in the early morning and the late afternoon.
- When the sun is directly above you, there is little or no shadow.
- A long time ago, people observed the way shadows were formed by the sun and utilized this principle to tell time with sundials.

**Air:**
- Air takes up space.
- Air has weight.
- Air is all around us.
- Air moves from areas of high pressure to low pressure.

**Wind**
- Moving air is called wind.
- Wind is formed when air moves from high to low pressure.
- Wind is categorized according to the strength: breeze, gust, squall, gale, storm, hurricane.
- Wind can move objects.
- Wind can power objects such as sail boats, balloons, gliders, etc.
- Wind can be harnessed and made into energy.

**Key Resources for All Ages** (link books to themes 2.E.04, artifacts, etc.)

A) Book References / Web Links:

**Books on LIGHT:**
All about Light (Rookie Read-About Science) by Lisa Trumbauer
Light is All Around Us by Wendy Pfeffer
The Sun Is Kind of A Big Deal by Neal Seluk
The Sun Is My Favorite Star by Frank Asch
The Sun Our Nearest Star by Franklyn Branley

**Science Videos on LIGHT:**
Sources of Light - [https://www.youtube.com/watch?v=d65mdTJaJTI](https://www.youtube.com/watch?v=d65mdTJaJTI)
All About The Sun - [https://youtu.be/VkW54j82e9U](https://youtu.be/VkW54j82e9U)
Books on SHADOW:
Gregory’s Shadow by Don Freeman
Moon Bear’s Shadow by Frank Asch
The Day I Met My Shadow by Melissa Brun
Guess Whose Shadow by Stephen R. Swinburne
The Colorful Shadow

Books on AIR:
Air is All Around You by Franklin M. Branley
Every Breathe We Take by Dominique Browning and Maya Ajmera
I Face The Wind by Vicki Cobb
Ollie and the Wind by Ronojoy Ghosh
Pop! A Book About Bubbles by Scholastic Books

Science Videos on AIR:
Air Takes Up Space Experiment:  
https://www.youtube.com/watch?v=2xF-JZ5rsBA
Balloon Powered Rockets:  
https://www.youtube.com/watch?v=KMX7zgaLC0w

Books on WIND:
Feel The Wind by Arthur Dorros
Kate, Who Tamed the Wind by Liz Garton Scanlon
Flora’s Very Windy Day by Jeanne Birdsall
The Wind Blew by Pat Hutchins
Kite Day by Will Hillenbrand

Science Videos on WIND:
Wind Energy - https://www.youtube.com/watch?v=4HdxQhBRDUI

Credits for activity ideas:
Frugalfun4boys.com
Emmaquay.com
Lessons4littleones.com
Instructables.com
Sunshineonmyshoulder.com
Theresjustonemommy.com

The Dad Lab
123homeschool4me.com
Kidactivitiesblog.com
Stlmotherhood.com
Littlebinsforlittlehands.com
**Division of the Conceptual Content by Week of the Unit**

**Focus Outline for the Light/Shadow/Air/Wind Unit Content**

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<td>Week 3</td>
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<td>Week 4</td>
<td>Wind</td>
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**Science Experiments**

| Week 1: | What melts in the sun?  
|         | Light Box Experiment  
|         | Which absorbs more heat: black or white?  
|         | The Sun Causes Evaporation  
|         | Reflecting Light  
|         | Solar Oven  |
| Week 2: | What makes a shadow?  
|         | Sun Shadow Print  
|         | Sun and Shadows: Lego man in the sun  
|         | Does everything have a shadow?  
|         | Colored shadows  |
| Week 3: | Does air take up space?  
|         | Does air have weight?  
|         | How does air move?  
|         | Bernoulli’s equation  
|         | Make a bubble blower.  |
| Week 4: | How air temperature causes air to move.  
|         | Can the wind move it?  
|         | What does the wind move?  
|         | Make a parachute  
|         | Make a kite  |

**Art Projects**

| Week 1: | Paper Plate Suns  
|         | Sun Catcher  
|         | Spread A Little Sunshine Card  |
| Week 2: | Shadow Art  |
| Week 3: | Plastic Bottle Wind Spinner  
<p>|         | Bubble Art  |
| Week 4: | Windchimes  |</p>
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<tr>
<td></td>
<td>Activity: What melts in the sun?</td>
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<tr>
<td></td>
<td>Materials: Muffin tin and assorted objects such as a Lego, ice, a block, butter, marble, cheese cube, crayons, chocolate, a piece of soap, a rock, a coin</td>
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<tr>
<td></td>
<td>Instructions: Fill a muffin tin with assorted objects. Predict whether the objects will melt or not melt when placed in the sun. Place the tray in the sun and set a timer of 10 min. Observe what happened. Reset the timer for 30 minutes. Observe</td>
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<td>Extensions: Does it make a difference?</td>
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<tr>
<td></td>
<td>• Use different colored crayons.</td>
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<td></td>
<td>• Use 2 identical muffin tins of objects. Place one in the sun and one in the shade.</td>
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<tr>
<td></td>
<td>Activity: Paper Plate Suns</td>
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<td><a href="https://emmaquay.com/blog/paper-plate-suns-craft-activity">https://emmaquay.com/blog/paper-plate-suns-craft-activity</a></td>
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<td></td>
<td>Materials: Paper plate, paints or markers, colored paper strips, decorations, glue</td>
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<td></td>
<td>Instructions: Paint your paper plate a sunny color. Glue paper strips around the plate as sun rays and decorate.</td>
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<th>Book: Light is All Around Us by Wendy Pfeffer</th>
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<td><a href="https://www.youtube.com/watch?v=3mxpGxTHKAI">https://www.youtube.com/watch?v=3mxpGxTHKAI</a></td>
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<tr>
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<td>Activity: Light Box Experiment</td>
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<td>Materials: cardboard box, foil, 4 bottles of water, food coloring</td>
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<td></td>
<td>Instructions: Take the 4 bottles of water. Leave one clear, and place a food drops of food coloring in the others</td>
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<td></td>
<td>Tape a large box shut. Trace the bottom of a water bottle twice on top of the box. Cut out circles. Cover the top of the box with foil.</td>
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</tbody>
</table>
| Day 3 | Book: The Sun Is Kind of A Big Deal by Neal Seluk  
https://www.youtube.com/watch?v=TNPwS_egWrk |
|-------|--------------------------------------------------|
|       | Science Video: All About The Sun  
https://youtu.be/VkW54j82e9U |
|       | Activity: What absorbs more heat, black or white?  
Materials: 2 jars or containers, water, black construction paper, white construction paper, thermometer  
Instructions: Fill both jars with equal amounts of water. Wrap one jar with the black paper and the other jar with the white paper. Set the black paper wrapped jar on a piece of black paper and the white wrapped jar on a white piece of paper and put them in the sun for several hours. Use the thermometer to measure the temperature in each jar. (If the water is not too hot, you can feel it.) |
| Day 4 | Book: The Sun Is My Favorite Star by Frank Asch  
https://www.youtube.com/watch?v=JOoWvZ9r9Qs |
|       | Activity: The Sun Causes Evaporation  
Materials: sun, water, paint brush or paint rollers  
Instructions: Use the water to paint on the sidewalk. Set a timer and time how long it takes the water to disappear (evaporate). |
Extension: to demonstrate evaporation paint a piece of construction paper with water and seal it inside a Ziploc bag with enough air inside so the top of the bag doesn’t touch the paper. Place it in a sunny area. Observe the baggie after the water starts to dry and condense on the baggie. The water from the paper evaporated and turned to water vapor which is trapped in the baggie and condenses on the bag as water droplets.

Activity: Light and Mirrors
Materials: a bright flashlight, handheld mirror, black paper, white crayon
Instructions: Cut several circles from the black paper and number them. These are the “targets”. Place the targets around the room. Practice aiming the flashlight beam at each target. Turn off the flashlight and hold up the mirror. What will happen to the light when it is aimed at the mirror? Turn on the flashlight and experiment on how the light is reflected off the mirror to another point in the room. Shift the light and then the mirror to change where the light shines. Try and “hit” the targets with the light beam.

Day 5
Book: The Sun Our Nearest Star by Franklyn Branley
https://youtu.be/1UOWJop-Oq4

Science Video: What is The Sun?
https://youtu.be/0b3GcLE4Vlg

Activity: Solar Oven
Materials: Watch this video to learn how to make an easy Solar Oven
https://www.youtube.com/watch?v=Uqmgu2L7kek&t=7s
Instructions: Use your solar oven to make S’mores, nachos, pizza crackers, etc.
Recipe Ideas here:
https://www.sunshineonmyshoulder.com/6-easy-recipes-for-kids/

BONUS ACTIVITY: Spread a Little Sunshine
Create a homemade “You Are My Sunshine” card to send to someone who needs a little pick me up.
### SHADOW Unit Content

#### Day 1

**Book:** Gregory’s Shadow by Don Freeman  
[https://www.youtube.com/watch?v=wdl9Ma_BMvs](https://www.youtube.com/watch?v=wdl9Ma_BMvs)

**Science Video:** Light and Shadow  
[https://www.youtube.com/watch?v=YuUJCNzfoBw](https://www.youtube.com/watch?v=YuUJCNzfoBw)

**Activity:** Shadow Hunt  
**Materials:** flashlight (or light source), assorted objects of various sizes, shapes and materials  
**Instructions:** Shine flashlight on each object. Does it make a shadow? Change the position or distance of the light. What happens?

**Activity:** Shadow Tag  
**Materials:** you, friends and a sunny day  
**Instructions:** Shadow Tag is like regular tag except no one touches each other. You only touch other’s shadow! When the child who is “it” tags another child’s shadow, have him or her yell “Tag! You’re it!” Then that child has to chase after the other’s shadows.  
**Extension:** Encourage the children to find ways to hide their shadows.

#### Day 2

**Book:** Moon Bear’s Shadow by Frank Asch  
[https://www.youtube.com/watch?v=DaBNagX1meY](https://www.youtube.com/watch?v=DaBNagX1meY)

**Song Video:** Furry Little Shadow Song with Grover  
[https://www.youtube.com/watch?v=k8jAEPMse4U](https://www.youtube.com/watch?v=k8jAEPMse4U)

**Activity:** Sun-Shadow Print Activity  
**Materials:** Black construction paper, assorted objects (hint: flat objects work best)  
**Instructions:** Place paper outside where it will get at least 4 hours of direct sunlight. (You may want to tape the paper down if it is windy.) Arrange the objects on the paper and allow them to sit for several hours. (For best results do not move the objects.)  
**Did you make a sun-shadow print?**
<table>
<thead>
<tr>
<th>Activity: Shadow Art (Positive/Negative Art)</th>
<th>![Image]</th>
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<tbody>
<tr>
<td><strong>Materials:</strong> black or colored paper, white paper, scissors, glue</td>
<td>![Image]</td>
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<tr>
<td><strong>Instructions:</strong> Cut a shape from the colored or black paper. You can cut simple shapes like triangles, squares or half circles. Or cut out an object like a tree or house.</td>
<td>![Image]</td>
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<tr>
<td>Place the white paper on the table. Place the cutout shape AND the black paper onto the white paper. Place the cutout shape next to the space it left so it looks like a shadow.</td>
<td>![Image]</td>
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<td>Glue pieces onto the white paper.</td>
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<th>Book: The Day I Met My Shadow by Melissa Brun</th>
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<td><a href="https://www.youtube.com/watch?v=8L52xSUtJNg">https://www.youtube.com/watch?v=8L52xSUtJNg</a></td>
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<td>Music: Shadows by Lindsay Stirling</td>
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<td><a href="https://www.youtube.com/watch?v=JGCsyshUU-A&amp;t=56s">https://www.youtube.com/watch?v=JGCsyshUU-A&amp;t=56s</a></td>
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<td>Activity: Sun and Shadows: Lego person in the sun</td>
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<td><strong>Materials:</strong> a Lego person, paper, pencil, tape, ruler</td>
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<td><strong>Instructions:</strong> Tape down a piece of paper outside on a sunny day. Put a Lego character on the paper and mark where its feet are so that you can put it in the exact same spot each time. Come outside throughout the day and trace the position of the shadow. Add the time of day. Use the ruler to measure the length of the shadow. Record next to time. Why do you think the shadow changed throughout the day? When was the shadow the longest? When was it the shortest?</td>
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<th>Day 4</th>
<th>Book: Guess Whose Shadow by Stephen R. Swinburne</th>
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<td><a href="https://www.youtube.com/watch?v=l4qEJo125WU">https://www.youtube.com/watch?v=l4qEJo125WU</a></td>
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<td>Game: Guess Whose Shadow?</td>
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<td><a href="https://www.youtube.com/watch?v=IGZs1g0L4SM">https://www.youtube.com/watch?v=IGZs1g0L4SM</a></td>
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<td><strong>Does everything have a shadow?</strong></td>
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<td>Activity: Does everything have a shadow?</td>
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<td><strong>Materials:</strong> dark room, flashlight, assorted objects plus the following: a clear glass, wax paper, balloon, glass of water, reading glasses, plastic water bottle, bubbles</td>
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<td><strong>Instructions:</strong> Take a flashlight and walk around the house looking for shadows. Almost everything has a shadow. Are the edges of the shadow crisp or blurry? Experiment with the objects collected making a prediction whether it will cast a shadow or not. What objects did not cast a shadow? Why?</td>
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### AIR Unit Content

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<tr>
<th>Day</th>
<th>Book: The Colorful Shadow &lt;br&gt;<a href="https://www.youtube.com/watch?v=KFoT2OBihhM">https://www.youtube.com/watch?v=KFoT2OBihhM</a></th>
<th>Activity: Colored Shadows &lt;br&gt;<a href="https://www.youtube.com/watch?v=u5DW6wJT3b8">https://www.youtube.com/watch?v=u5DW6wJT3b8</a></th>
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<td><strong>Materials:</strong> 3 strong flashlights, red, blue and green sharpie, clear tape, white paper or wall and a dark room</td>
<td><strong>Instructions:</strong> Place the tape over the lens of the flashlights. Color each taped lens a with a different colored sharpie.</td>
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<td><strong>Shine all three lights onto the paper and angle until you see a faint white light.</strong></td>
<td><strong>Place an object in front of the light. What do you observe?</strong></td>
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<tr>
<th>Day 1</th>
<th>Book: Air is All Around You by Franklin M. Branley &lt;br&gt;<a href="https://www.youtube.com/watch?v=9__Mm7VSK-s">https://www.youtube.com/watch?v=9__Mm7VSK-s</a></th>
<th>Science Video: Air Takes Up Space Experiment: &lt;br&gt;<a href="https://www.youtube.com/watch?v=2xF-JZ5rsBA">https://www.youtube.com/watch?v=2xF-JZ5rsBA</a></th>
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<td><strong>Activity: Does Air Take Up Space?</strong>&lt;br&gt;<strong>Materials:</strong> cup, paper towel, large bowl filled with water</td>
<td><strong>Instructions:</strong> Ball up the paper towel and push into the bottom of the cup. Check that the paper towel stays in the bottom of the cup when the cup is up-side down.</td>
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<td><strong>Turn the cup up-side down and slowly place into the bowl of water making sure not to tilt the cup.</strong></td>
<td><strong>Count to 20 and then slowly lift out making sure not to tilt the cup.</strong></td>
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<td><strong>Check the paper towel. Is it wet or dry? What is in the cup besides the paper towel?</strong></td>
<td><strong>Now repeat the experiment this time tilting the cup slightly to one side when in the water.</strong></td>
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<td><strong>What happens? Did you see the air?</strong></td>
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### Does Air Have Weight?

**Activity: Weighing Air**

**Materials:** 2 balloons, a hanger with a piece of yarn tied to the middle, tape

**Instructions:**
- Blow up one balloon and tie it. What is in the balloon?
- Tape the filled balloon to one end of the hanger.
- Tape the empty balloon to the other end of the hanger.

Hold the hanger by the hook so that it is a balance scale. What happens? Which balloon is heavier?

### Day 3

**Book:** I Face The Wind by Vicki Cobb  
[https://vimeo.com/203764593](https://vimeo.com/203764593)

**How does Air move?**
- Air moves from high to low pressure

**Materials:** balloon

**Instructions:** Blow up a balloon but do not tie it. Let it go! What happens?

**Activity:** Balloon Powered Rocket  
**Science Video:** [https://www.youtube.com/watch?v=KMX7zgaLC0w](https://www.youtube.com/watch?v=KMX7zgaLC0w)

**Materials:** packing tape, picture of rocket (clip art or your own), straw, string

**Instructions:**
- Cut a long length of string and affix one end to a surface that is elevated.
- Thread the string through the straw.
- Tape the other end of string to a low point.
- Blow up the balloon but do not tie. (Hint: Keep it closed with a clothespin.)
- Use a piece of tape to adhere the balloon to the straw.
- Tape the rocket onto the straw.
- Release the balloon and watch it soar!

**Extension:** Race 2 rockets!

### Day 4

**Book:** Ollie and the Wind by Ronojoy Ghosh  
[https://www.youtube.com/watch?v=-zNvEBasw1Q](https://www.youtube.com/watch?v=-zNvEBasw1Q)

**Activity:** Bernoulli’s Equation – Anti Gravity Ping Pong Ball Experiment  
[https://123homeschool4me.com/anti-gravity-ping-pong-ball-science_9/](https://123homeschool4me.com/anti-gravity-ping-pong-ball-science_9/)

**Materials:** Hair dryer, ping pong ball, funnel, empty toilet paper roll, duct tape

**Instructions:** Turn on the hair dryer and place the ping pong ball inside the column of air flow and watch it hover in space.
Place the funnel in your mouth and try to blow the ping pong ball upward and out of the funnel. Can you?  
Tape the funnel into the toilet paper roll.  
Tape the toilet paper roll onto the end of the hair dryer.  
Turn the hair dryer on high with low heat or cool setting.  
Place the ping pong ball inside the funnel and slowly start turning the hair dryer upside down. What happens? Does the ball blow out of the funnel when it is upside down?

**Activity: Plastic Bottle Wind Spinner**  
**Materials:** 1-liter plastic bottle, colored duct tape, box cutter, scissors, snap swivel, (a piece of fishing tackle that allows the bottle to spin without getting tangled), coated paper clip, fishing line  
**Instructions:** Wash out bottle and remove label.  
Cover the middle section of the bottle with tape.  
Starting at the top of the tape and ending at the bottom of the tape, cut vertical slits into the bottle about ¾” apart.  
Push the top of the bottle toward the bottom of the bottle. This will cause the slits to collapse. Hold in place and fold each slit in the center, creating a crease.  
At the top of each slit make a 45-degree fold to the right. At the bottom, make a 45-degree fold to the left. This allows the wind to catch them and make them spin.  
Cut a small hole in the top of the bottle cap. Unfold the paper clip and thread through looped end of snap swivel.  
Twist the paper clip together and insert into the hole of the bottle cap. Bend the ends so the paper clip cannot come back out the hole. Twist the cap back on to the bottle and hang from the open end of the snap swivel using the fishing line.

| **Day 5** | **Book:** Pop! A Book About Bubbles by Scholastic Books  
[https://www.youtube.com/watch?v=J19TkZY6oMc](https://www.youtube.com/watch?v=J19TkZY6oMc) |
Activity: Make your own Bubble Blower
Materials: Plastic cup, plastic straw, Dawn liquid soap, water
Instructions: Poke a hole in the side of your plastic cup about 1 inch from the bottom. The hole needs to be big enough to stick the straw through.
Pour in ½ part water and ½ part soap, keeping the liquid lower than the hole.
Stick the straw in the cup and BLOW!

Activity: Popped Bubble Art
Instructions: Pour a small amount of bubble solution into a small, shallow bowl.
Add a few drops of food coloring to bowl and stir.
Place bubble wand into solution, and blow bubbles towards paper.
As the bubbles hit the paper and pop, they will leave interesting patterns.
Repeat with other colors.

WIND Unit Content

Day 1

Book: Feel The Wind by Arthur Dorros
https://www.youtube.com/watch?v=jWxJEMo2tiM

Science Video: Bill Nye explains what causes wind
https://youtu.be/uBqohRu2RRk

Activity: How air temperature causes air to move
Materials: empty plastic water bottle, balloon, bowl of hot water
Instructions: Place the balloon over the top of the water bottle.
Set the bottle in the bowl of hot water.
What happens to the balloon?
Did the air inside the bottle move?

Activity: Blow painting with straws
Materials: card stock or construction paper, liquid watercolor, dropper, drinking straws
Instructions: Place a sheet of paper on a tray with sides or do this activity outside.
Cut the straws in half. (If you have young children, poke a hole halfway up the straw with a pin. This will prevent them from sucking paint into the straw.)
Put the liquid watercolor paints in small dishes.
Use the dropper to transfer one or more droplets of paint onto the paper. Blow through the straw at the paint drops, forcing the paint to move along the paper. Repeat with more paint and more colors. Set aside to dry and start again with new sheet of paper.

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<td>Activity: Can the Wind move it? Materials: a variety of objects (some that can be moved and some that cannot) such as a feather, block, spoon, cotton ball, piece of paper, rock, etc. Instructions: Place a variety of objects on the table. Predict which will move when you blow them. Test each object. Extension: Test the objects again with a fan.</td>
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<td>Activity: What does the Wind move? Materials: plastic container lid, Vaseline, yarn Instructions: Poke a hole through the plastic container lid. Tie a piece of yarn through the hole so that you can hang the lid outside. Cover the plastic lid with a coating of Vaseline. Hang the lid from a tree branch. Check the lid after a few hours to see what has stuck to the lid. What has the wind blown?</td>
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<th>Day 3</th>
<th>Book: Flora’s Very Windy Day by Jeanne Birdsall <a href="https://www.youtube.com/watch?v=4siUegAUh_c">https://www.youtube.com/watch?v=4siUegAUh_c</a></th>
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<td>Activity: Windchimes Materials: There are so many ways to make wind chimes! Here is just one idea: assorted tin cans, tape, paint, string, hammer, nail, metal washers or nuts, glitter (optional) Instructions: Tape the edges of the cans to prevent any cuts. Paint the outside of the cans. (Sprinkle glitter onto wet paint.) Use the hammer and nail to punch a hole in the bottom of the cans.</td>
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String a long piece of yarn through the holes and tie two washers to the end of the string. One washer to hold the yarn in place and one at the end of the string to make a clanking sound. Hang up the tin cans so that they overlap each other.

Extensions: Try these wacky creatures! Use your imaginations!

| Day 4 | Book: The Wind Blew by Pat Hutchins  
https://www.youtube.com/watch?v=pRlq02DEpyg |
|-------|--------------------------------------------------|
|       | Activity: Parachutes  
Materials: coffee filter, 2 pipe cleaners, scissors  
Instructions: Make a stick person from ONE pipe cleaner. Twist a loop in the middle for a head, bend back both ends for arms, twist those ends together for the torso, what’s left is legs. |
|       | Take a second pipe cleaner and poke one end through the edge of the coffee filter. Fold over once to secure. Take the free end and run through the hands of the stick man. (his arms are loops.) Connect the free end to the coffee filter and bend up. Take the parachute guy someplace high and release him to gently float to the ground. |
|       | Extension: Can you make your own parachute out of recycled items? |

| Day 5 | Book: Kite Day by Will Hillenbrand  
https://www.youtube.com/watch?v=9IGmeddXs3o  
Let’s Go Fly A Kite – song from Mary Poppins |
| Activity: Make Your Own Kite  
Simple directions with photos on how to make your own kite!  
https://littlebinsforlittlehands.com/how-to-make-a-kite/ |
|---------------------------------------------------------------|