Wacky Weather Day 1: Thunderstorm Simulation

Materials:

Water (for ice cubes)	1 cup
Blue Food Coloring	3 drops
Ice Cube Tray	1
Measuring Cup	1
Large, clear container	1
Lukewarm Water	To fill container
Red Food Coloring	5 drops

Video Link: https://youtu.be/SFAkAVpVNCY

Background:

- A thunderstorm is produced by a cumulonimbus cloud, and often produces strong winds, heavy rain, and (sometimes) hail or tornadoes.

- A thunderstorm needs 3 things to form:
    1. Moisture: Forms clouds and rain
    2. Unstable Air: Warm and rises rapidly
    3. Lift: Comes from fronts, sea breezes, or mountains

Vocabulary:

Thunderstorm	a storm with lightning and thunder
Moisture	water or liquid diffused in a small amount as vapor
Lift	an upward force that counteracts the force of gravity

Preparation:

Make blue ice cubes for the next day by pouring water into a measuring cup, mixing 3 drops of blue food coloring, and pouring into ice cube tray. Freeze overnight.

Instructions:

1. Fill your container with lukewarm water. It is important that it's lukewarm.

2. Add 5 drops of red food coloring to one side of the container.
    - This is your warm front.

3. Add 2 blue ice cubes to the opposite side of the container.
    - This is your cold front.

4. As the red food coloring disperses into the water, the blue ice slowly melts and sends cold, blue water into the container.

5. When the two temperatures of water meet, the cold (blue) air forces, or lifts, the red (warm) water upward! The location and time at which they meet is when a thunderstorm begins.
    - Warm and cold air meet, creating unstable air.
    - The combination of unstable air, moisture in the atmosphere, and a cold front pushing the warm air upward, results in a thunderstorm.

6. Eventually, the temperatures will even out, creating purple water.
    - Your thunderstorm is now over.
    - The rain cools the warm air and decreases the moisture in the atmosphere, allowing the air to stabilize and the thunderstorm to end.

Evaluation:

- How did the blue water make the thunderstorm happen?

Further Exploration:

Visit...
- https://www.pbs.org/wgbh/nova/labs/lab/cloud/ to investigate clouds and their impact on the weather.

Read...
- The Cloud Book, by Tomie de Paola
- Peterson: First Guide to Clouds and Weather, by Vincent J. Schaefer and Roger Tory Peterson

Wacky Weather Day 2: Rain Gauge

Materials:

Scissors	1
Empty Bottle	1
Permanent Marker	1
Pebbles or rocks	1 cup
Measuring tape or ruler	1
Tape	2 feet
Water	amount depends on bottle size

Video Link: https://youtu.be/rklFKBkLTm8

Background:

- Other names for rain gauges include udometers and pluviometers.
- Tulsa's climate is considered "humid subtropical", meaning it has hot and humid summers and cold to mild winters.
    - May is the wettest month in Tulsa, with an average of 5.9 inches of precipitation, or rainfall.

Vocabulary:

Rain Gauge	a device for collecting and measuring the amount of rain that falls
Climate	the weather conditions prevailing in a certain place for a over a long period of time. This is different than weather, which is how the atmosphere is behaving minute-to-minute
Precipitation	rain, snow, sleet, or hail

Preparation:

Over time, collect water bottles, milk jugs, or soda bottles as usable recyclables.

Instructions:

1. With your marker, draw a line at the point on the bottle where it begins to turn into a funnel shape.
2. Using scissors, carefully cut the bottle along the line, removing the top of the bottle. Save this piece for later use.
3. Pour the pebbles or rocks into the bottom of the bottle to weigh it down and keep it from tipping over in the wind. Pour water in until it reaches the top of your rocks.
4. With your marker, draw a line at the top of your rocks. Using your ruler, make marks 1 inch apart, beginning at the top of your rocks.
5. Place the top of the bottle upside down so that it rests comfortable at the top of the rain gauge. Tape around the bottle so that your funnel is secure.
6. Place your rain gauge in an open area where it will not be blown over.
7. Wait for the rain to come and check your rain gauge daily, weekly, or monthly.This information can be charted or graphed and averaged (add rainfall data by inches, and then divide by number of days or weeks tracked).

Evaluation:

- How much rain fell yesterday? Can you tell me how much rain fell in inches? In centimeters?
- What is the difference between how much rain fell yesterday and today? Between this week and last week?

Further Exploration:

Visit...

- http://teacher.scholastic.com/activities/wwatch/investigate/weather_maker.htm to simulate temperature and precipitation changes to see how to make different types of weather.

Read...

- STEM Starters for Kids: Meteorology Activity Book, by Jenny Jacoby and illustrated by Vicky Barker

Wacky Weather Day 3: Anemometer Engineering

Materials:

Hole Punch	1
Marker, crayon, or paint	1
Paper or plastic cups	5
Push pin or paper clip	1
Straws	4
Tape	1 roll
Unused pencil with eraser	1
Nail	1
Timer/stopwatch	1
Optional Extensions:	
Ruler	1
Paper	1
Pencil or pen	1

Video Link: https://youtu.be/43ex0uLUvVM

Background:

- Wind is caused by differences in air pressure; it is caused by air rushing from high pressure areas to lower pressure areas.

- Wind can provide energy. Wind power can be harnessed through wind mills or wind turbines, to create clean and renewable energy.

Vocabulary:

Anemometer	an instrument for measuring the speed of wind, or of any current of gas
Average	a number that expresses the typical value in a set of data; calculated by dividing the sum of the values in the set by the number of values in the set
Wind	the flow of gases; on Earth, it is the movement of air

Further Exploration:

Visit...

- https://climatekids.nasa.gov/power-up/ to harness the power of air through a virtual wind turbine.

Read...

- The Boy Who Harnessed The Wind, by William Kwamkwamba and Bryan Mealer.

Preparation:

Check the weather forecast for days that may be particularly windy.

Instructions:

1. Take 2 straws and join them together to make one long straw. Repeat.

3. Prepare your cups. If you have plastic cups, cut them down so that they are only 2-3 inches tall. Use your hole punch to punch two holes in each cup, directly across from each other.

3. On the end of one cup, use your marker/crayon/paint to make this cup different than the other cups so that you can count each time this cup passes.

4. Slide a cup on each end of your two straw segments. Tape the cups to the straws so that they can not slide off the ends, making sure the cups are all facing the same way.

5. Make an 'x' or '+' with the straws, so that they are perpendicular to each other. Attach with tape in the center so that they are secure.

6. Using your nail, carefully press through the center of the 'x' or '+' you have created with your straws. Make your hole large enough for your push pin or paper clip to spin freely, but not so large to break the connection of your straws.

7. Push your pin or opened paper clip through the hole you just made, into the eraser end of the pencil underneath your straws, creating a handle.

8. To test your completed anemometer, go outside and hold it up by the pencil handle. When you're ready to begin counting, start your timer for 1 minute.

9. As the anemometer spins, count how many times the marked cup passes - these are called revolutions. Do this many times in many locations. Record the number of revolutions in each location.

10. Add each of your total revolutions together, and then divide by the number of locations you tested. You have now calculated an average wind speed in your area!

Optional Extensions:

- This information can also be charted or graphed, as wind speed by increment of testing (hourly, daily, wekly, etc.) using paper, pencil, and ruler.
- You can convert your wind speed per revolution to miles per hour by making the following calculations.
    - Use a ruler to measure the diameter of the wind anemometer; measure from the end of one cup to the the end of another.
        - Solve for the circumference of the anemometer: Circumference (C) = Diameter (D) x Pi (3.14)
    - Now, convert your Circumference (C) into a fraction by putting it over 1. Multiply that fraction by 1 foot / 12 inches.
        - This equation will look like: C / 1 x 1 foot / 12 inches. This converts inches to feet.
    - Now solve for feet per minute : C (in feet) / 1 x Revolutions / 1 minute
    - This number will be how many feet per minute the wind travels. If you want to continue and calculate it per hour:
        - Multiply: total feet / minute x 60 minutes / 1 hour
    - If you want to solve for miles per hour, divide total feet by 5,280 feet are in a mile.
        - Total feet / hour x 1 mile / 5,280 feet. You now have the wind speed in miles per hour!

Evaluation:

- What time of day was the windiest? How do you know?
- Are there certain areas in your yard that are windier than others? How do you know?

Wacky Weather Day 4: Spectroscope

Materials:

Empty Paper Towel Tube	1
Craft Knife/Scissors	1
Blank or Old CD/DVD	1
Pencil	1
Cardboard/Cardstock	1 small piece
Tape	1 roll
Decorative Materials	Creators choice

Video Link: https://youtu.be/A4YDJWMQpRI

Background:

- When you look at sunlight, it looks white. However, it isn't white; it is a combination of many colors.
- Sir Isaac Newton identified the 7 colors of the visible spectrum that make up white light; these 7 colors are present in a rainbow: red, orange, yellow, green, blue, indigo, and violet).

Vocabulary:

Spectroscope	a tool used to help scientists determine the makeup of a visible source of light; they separate different colors of light so that scientists can understand the composition of an object.
Diffract	the process by which a beam of light or other wave system is spread out as a result of passing throw a narrow aperture.
Reflect	when the light is thrown back without being absorbed.

Preparation:

Plan to do this activity on a day when there is a good amount of sunlight in the weather forecast.

Instructions:

1. Paint or decorate the tube however you would like.
2. Cut a slit in the tube at a 45° angle, approximately 3 inches from one end. Have an adult help with this step if needed.
3. On the opposite end of the tube, cut a small 'viewing hole' approximately 1 centimeter by 1 centimeter in size, 2 - 3 inches from the end.
4. Trace one end of your paper towel roll onto your scrap of cardboard or cardstock. Once you have traced this circle, cut it out.
5. Without cutting the circle in half, cut a small rectangle across the center of your circle. Tape this circle to the end of the tube that you cut your viewing hole.
6. Insert your CD into the 45° slit so that the shiny side is facing up. Your spectroscope is finished!
7. Point the top slit toward the sky (not directly at the sun). Look through the viewing hole.
    - What do you see? (You should see a rainbow).
        - Why do you see a rainbow?
            - A CD is a mirrored surface that has spiral tracks. These tracks are spaced evenly and diffract light that comes in through the top of the spectroscope.
            - Because the surface of the CD is mirrored, it reflects the light to your eyes.
    - You can also try the spectroscope with different types of light!
        - Fluorescent, neon, candle, indoor, cloudy-day

Evaluation:

- What did you see inside your spectroscope?
- How many colors did you see? Can you name those colors?
    - Why did you see those colors?

Further Exploration:

Visit...

- https://kids.nationalgeographic.com/explore/space/sun/ to learn more about the Sun and the planets in our solar system.

Read...

- Sun! One in a Billion, by Stacy McAnulty and illustrated by Stevie Lewis.

Wacky Weather Day 5: Tornadoes

Materials:

Water	3/4 bottle
Dish Soap	a few drops
Lightweight Beads	small handful
Glass Jar or Bottle with lid	1
Stir Stick (if no lid)	1

Optional Extension:

Food Coloring	3-5 drops
Heavy Beads	small handful
Sand	small handful

Video Link: https://youtu.be/CD-CHcoMWMU

Background:

- Tornadoes often occur during thunderstorms and extend from the storm to the ground. They can produce wind speeds up to 300 miles per hour.

- Tornadoes form when warm, moist air, meets cool, dry air; this meeting causes instability in the atmosphere. During this instability, wind direction can change and wind speed can increase, causing air to rotate horizontally. When the air rises at the same time rotation happens, it causes the air to rotate vertically rather than horizontally, creating vortexes and leading to strong tornadoes.

Vocabulary:

Tornado	a mobile, destructive vortex of violently rotating winds; appears as a funnel-shaped cloud and advances beneath a large storm system
Vortex	a mass of whirling fluid or air

Preparation:

Save a bottle or jar as a recyclable to use for this project.

Instructions:

1. Fill your bottle or glass three-fourths full with water.

2. Put a few drops of dish soap into the jar.

3. While holding the glass, either put the lid on, or use the stir stick:
    - Stir the water quickly in a circular motion, or rotate the jar in circles.
        - You will see a vortex or column of spinning bubbles form.

4. Put the jar down and observe. What do you see?

5. Once the vortex is gone, add some light beads to the jar, and repeat the experiment. What do you see when you add the beads?

6. When you spin the water, a vortex is created in the center of the bottle. This is similar to the vortex in tornadoes. In vortexes, water on the outside has to move faster than the water on the inside.

Optional Extension:

- Use different materials and experiment to see if other supplies work to make a vortex.
    - What happens when you add food coloring?
    - What happens when you add heavier beads?
    - What happens when you add sand?

Evaluation:

- How is this water vortex similar to a tornado in our atmosphere?
- How does a tornado form?

Further Exploration:

Visit...

- https://www.nssl.noaa.gov/projects/vortex2/learn/ to learn all about the science behind tornadoes.

Read...

- National Geographic Kids: Extreme Weather: Surviving Tornadoes, Sandstorms, Hailstorms, Blizzards, Hurricanes, and More! by Thomas M. Kostigen