Eagle Bluff Environmental Learning Center

# STEAM Experiments

Revised March, 2023

## Activity Framework

**Purpose**
Experience simple scientific concepts through a variety of easy-to-do experiments.

**Activity Outline (select activities with a total time of ~75 minutes)**

| | |
|---|---|
| Rain Cloud in a Jar | (20 min) |
| Shaving Cream Art | (20 min) |
| UV Pen Art | (15 min) |
| Laminar Flow Water Balloon | (15 min) |
| Static Electricity Critters | (15 min) |
| Walk Along Paper Gliders | (25 min) |
| Marble Pipeline | (30 min) |
| Wind-Powered Car | (40 min) |
| Clean Up | (15 min) |

## Quick Tips

1. Note that when choosing your experiments/activities, some experiments/activities are messier than others (*Rain Cloud in a Jar*, *Shaving Cream Art, Wind-Powered Car).*
2. Also note that when selecting the experiments/activities, some require more supervision than other (*Rain Cloud in a Jar*, *Shaving Cream Art, Laminar Flow Water Balloon, Walk Along Paper Gliders)*
3. It may be difficult to have all students doing the same activity at once. We recommend you have experiment/activity stations for students to rotate around to.
4. Make sure you and students read all directions completely before beginning.

## Table of Contents



## Materials

- Lesson plan
- Activity directions
- Shaving cream (1)
- Food coloring
- Mason jars (3)
- Plastic blue mugs
- Pipettes (3)
- 8.5x11 cardstock
- Icing scrapers (2)
- Acrylic paint
- Toothpicks
- Newspaper
- Invisible ink pens (14)
- Printer paper
- Plastic bags
- Scissors
- Balloon pump
- Balloons
- Twisting balloons
- Scotch tape
- Marble pipeline bucket w/ marbles (7)
- Stopwatch
- Safety pins
- Electrical tape
- Phone books
- Glider frames (12)
- Scissors
- Dowels
- Pipe cleaner
- Round wooden wheels
- Masking tape
- Single hole punch

**Not found in kit:**

- Large cardboard glider pieces
- Wind-powered Car cardboard
- Box fans
- Extra scissors

# Rain Cloud in a Jar

This experiment is a fun way to show how water condenses inside clouds to form rain. The shaving cream represents a cloud while the food coloring you add represents rain!

**Time**: ~20 minutes

**Supplies:** shaving cream, Mason jars (#), food coloring (colors), plastic blue mugs, pipettes (#)

**Science Concepts:** Condensation, Diffusion

1. Fill the Mason jars ~3/4 to the top with water.


2. Add 8-10 drops of food coloring to a small blue mug filled with 2-3 inches of water. Use the provided pipette to stir the food coloring into the water.


3. Shake the shaving cream. Only chaperones should spray it into the jar so that it is resting on the surface of the water and still inside the jar. Only a few inches of shaving cream are needed.


4. Fill a pipette with the colored water and hold it a few inches above the shaving cream. Add a drop of colored water every second. Be sure to evenly distribute the droplets on the cream.

5. Once the colored water breaks through the shaving cream and into the jar, stop adding the colored water. Observe how the coloring behaves as it moves towards the bottom of the jar.

6. Feel free to mess around with different color combinations to make some *rainbow rain*!

# Shaving Cream Art

Use food coloring and shaving cream to make some simple pieces of art.

**Time**: ~20 minutes

**Supplies:** shaving cream, food coloring (colors), acrylic paint, icing scrapers (2), cardstock paper, toothpicks, newspaper

**Science Concept:** Adhesion

**Note: A lot of food coloring and paint may cause streaking. A little food coloring or paint goes a long way!**

1. One table will have the painting supplies (acrylic paint, food coloring, icing scrapers, toothpicks) for students to share. All tables should be covered with newspaper. Grab two pieces of 8.5x11" cardstock.

2. Only chaperones should spray a handful of shaving cream onto one of each student's piece of cardstock. Using hands or the icing scraper, spread the shaving cream to get a thin, even layer on the cardstock.

3. Drop some food coloring and/or some acrylic paint onto their thin layer of shaving cream. Running a toothpick through the food coloring/paint helps create a marble pattern in the shaving cream. Food coloring will streak less than the paint.

4. Very lightly press the other piece of cardstock onto the shaving cream so the food coloring/paint absorbs into the top piece of cardstock. Some shaving cream will also stick to the cardstock.

5. Lay the top cardstock piece onto the table with the painted side facing up. Use an icing scraper to get the shaving cream off. There should be a mirror of the design you made in the shaving cream.

6. Repeat steps 3-5 two to three more times to add to your design. Wipe/rinse the icing scraper off after step 5 to avoid getting streaks from the previous scrape.

# UV-Pen Art

Have your students test their skills making invisible pieces of art. Then, give them the chance to see their art by shining a special light on it!

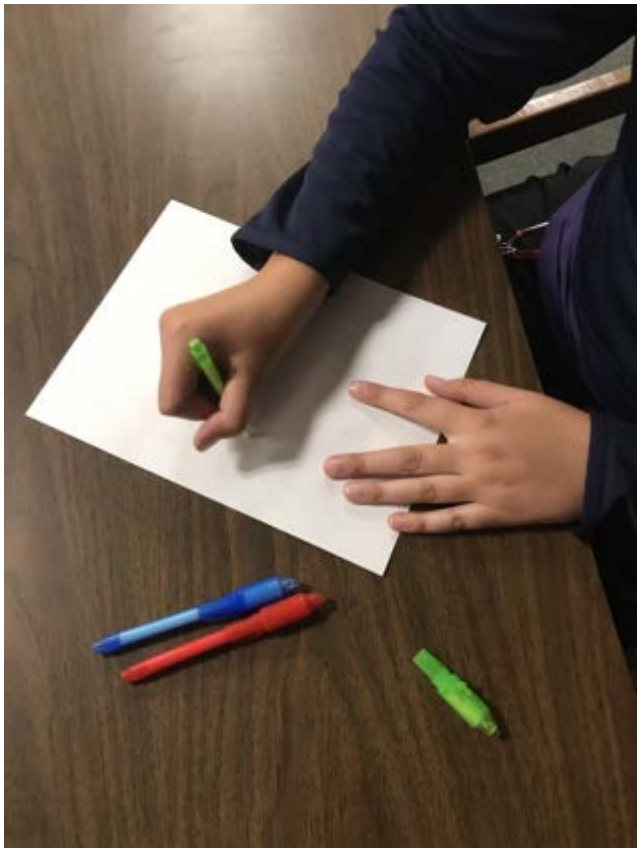
**Time**: ~15 minutes

**Supplies:** invisible ink pens (#), UV flashlights (#), printer/scrap paper

**Science Concepts:** Fluorescence, Visible vs. invisible wavelengths

1. Get a pen with a UV flashlight cap and a piece of printer paper to draw on. Although the pens are different colors, they all have the same color ink so it doesn't matter which one you get.

2. Take some time to draw any school appropriate art on the provided paper. Students are welcome to draw on their hands if you want to! It might help to close the blinds and have some of the lights in the room turned off so students can check drawings from time to time.



3. Once they have a final product, shine the flashlight on the art to see what they created!

# Laminar Flow Water Balloons

Experience the optical illusion of laminar flow, where flowing water looks frozen in time, with this quick and easy demonstration.

**Time**: ~15 minutes

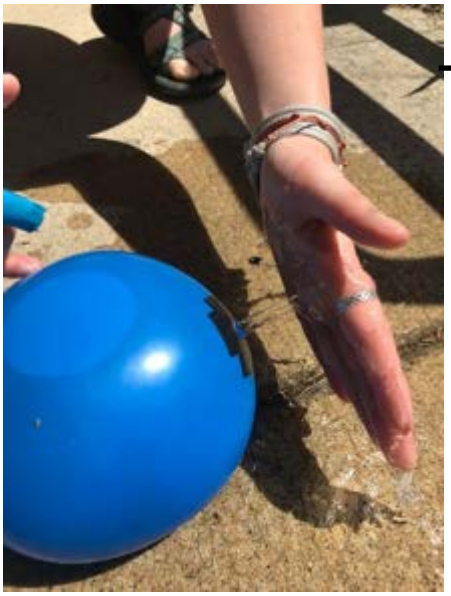
**Supplies:** balloons, water balloon sink attachment, electrical tape, safety pins, rags, food coloring, phone camera (optional)

**Scientific Concept:** Fluid mechanics

1. Fill balloons with water as much as you can without popping the balloon (~the size of a head). Use the sink adapter to make filling the balloons easier. Try to get as much air out of the balloon as possible and tie off the end of the balloon.

2. Use a rag to dry off the outside of the water balloon. Cut four pieces of electrical tape off the roll and attach them to the balloon on the opposite end to the knot, making a square inside the tape that is a little smaller than a dime. The smaller the square, the longer the effect!

3. Poke a small hole inside the tape using a safety pin. You can let the water flow normally or lightly press down on the balloon to change the rate of flow. **If the temperature outside is below freezing, please do this away from any sidewalks or trails.**



4. To witness the full effect of the illusion, either film the flow that is occurring closest to the balloon or block your peripheral vision so all you can see is the flow nearest to the balloon. The water near the balloon should look like it is frozen but if you move your hand in the way of the flow, you will realize it is still flowing. This kind of flow happens with thicker fluids, such as maple syrup or honey.

5. Please limit each student to using at most two balloons. They can try different variations, like creating multiple flows on the same balloon or adding food coloring to their water balloon!

# Static Electricity Critters

This paper airplane/glider can fly forever if done properly and given the right push. This activity definitely requires a larger space to prevent student collisions. Make sure you read through all the directions before beginning!

**Time**: ~15 minutes

**Supplies:** Shaping balloon, balloons, balloon pumps (3) plastic bags, scissors

**Scientific Concept:** Polarization, Static electricity

1. Grab a balloon animal or regular balloon. Inflate their balloons using their lungs or one of the balloon pumps. **Note**: the balloon animal balloons should be filled with the pump. Twist the two ends of the balloon animal balloon to get a circle.

2. Cut out a shape from the plastic bags provided. Options include a spider, snake, or ring. Or get creative and cut out your own design! The piece should be no larger than their hand for the experiment to work.

3. Rub the balloon and plastic bag cutout on hair or clothes to create a static charge on both items. Cleaner hair works best for this!

4. Release the plastic bag cutout about a foot over the balloon and watch as the cutout levitates above the balloon. Adjust the position of the balloon as the cutout moves around in the air.

5. If the cutout lands on something, pick it up and recharge the balloon and plastic bag cutout as done in step 3.

6. Try to make cutouts of various shapes. Which shapes work the best at floating? Which balloon is better for making their critters float?

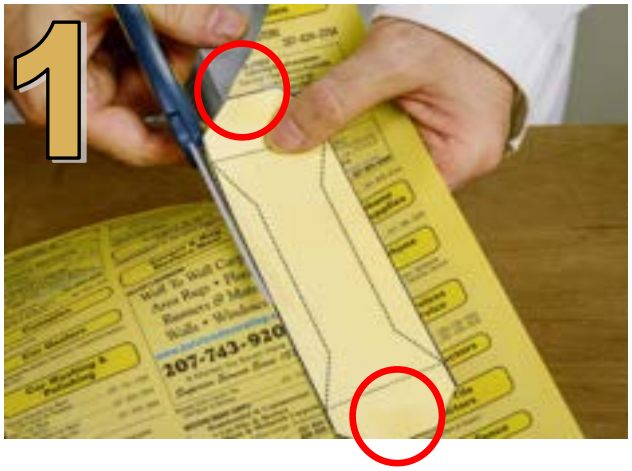
# Walk-along Paper Glider

This paper airplane/glider can fly forever if done properly and given the right push. This activity definitely requires a larger space to prevent student collisions. Make sure you read through all the directions before beginning!

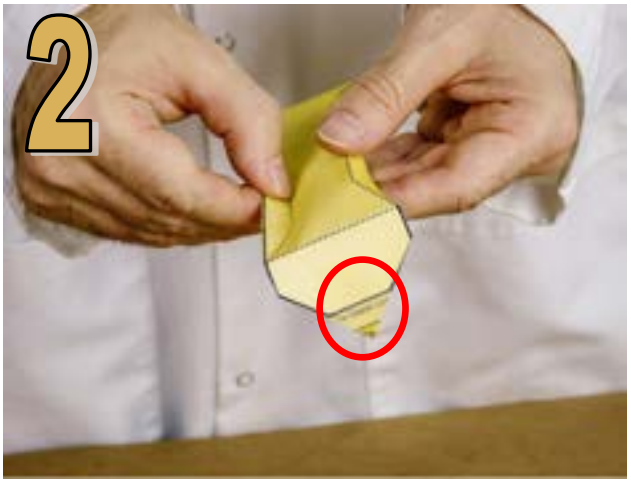
**Time**: ~25 minutes

**Supplies:** glider templates, phone books, scissors, large pieces of cardboard (2), scotch tape

**Scientific Concept:** Lift vs. Gravity, Propulsion

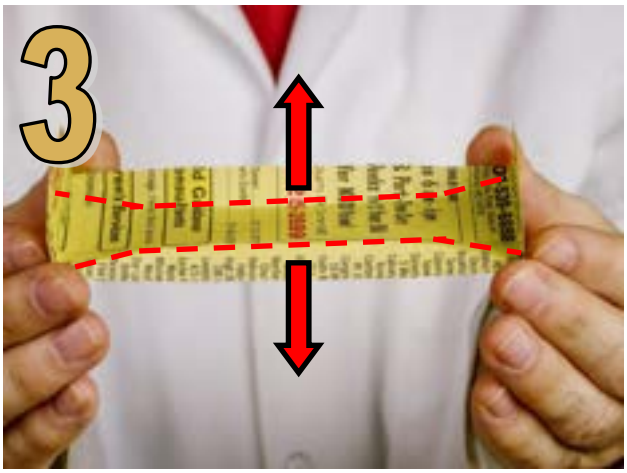



1. Grab a yellow template. Trace out the template shape on a phone book page and cut it out from there. However, taping the ends of the template to the phone book (where the red circles) are and cutting it out from there will make the next step (folding) easier and give better results.

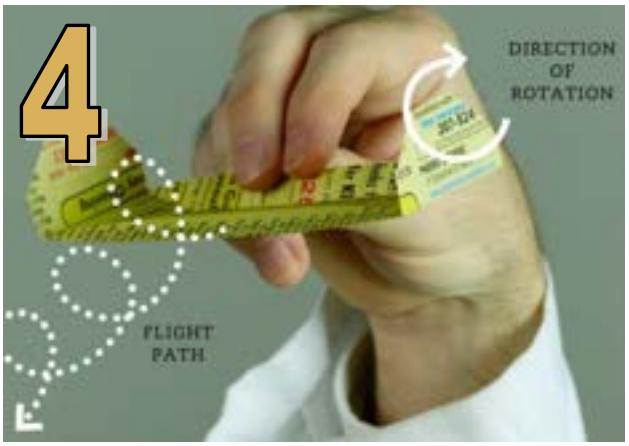



2. Leave two little points where the tape is attached. They will get cut off later on but it is easier to properly fold the glider while it is taped to the template. Fold both ends up 90° where the dotted lines are. Fold the edges at 45°, one upwards and the other downwards where the other dotted lines are.

# Walk-along Paper Glider (cont.)




3. Cut off the ends with the tape and remove the template. Clean up your folds so the glider looks like the picture to the left. The arrows represent which way the folds go. Note how the bends that go lengthwise across the paper (represented by the red doted lines) curve toward the corners of the glider as they approach the ends.




4. When you are ready to release your glider, hold it with the ends pointing up and by the upward angled flap. Have somebody hold it about a foot above and a foot in front of the large piece of cardboard that somebody else is holding. Give the glider a light forward and downward push to get it started. The picture to the left shows the flight path it should take.


5. Holding the cardboard at a slight angle, walk forward behind the glider with the cardboard. This will create an updraft under the glider, allowing it to stay aloft as long as you walk with it. It will take some practice to get the hang of it so keep trying! Resist the temptation to tilt the cardboard at more of an angle. If the glider drops too quickly, walk faster instead of tilting the cardboard more. If the glider turns to one side or the other, make sure the ends are as straight and vertical as possible. See who can keep their glider in the air the longest!

# Marble Pipeline: Tallest Structure, Longest Roll

Students will design the tallest free standing Marble Maze structure and/or design a Marble Maze structure that can keep a marble rolling as long as possible.

**Time**: ~25 minutes

**Supplies:** marbles, Marble Pipeline pieces (various shapes and colors), stopwatch

**Scientific Concept:** Structural integrity, Resistance.

1. First, decide which one of the two activities to do using the materials provided: “Tallest Structure” or “Longest Roll.”

2. Tallest Structure: In small groups, try to creatively build the tallest free standing structure, *without* using the piece labeled “base” or human contact. A marble must pass all the way through the structure and into one of the provided marble catchers without tipping over.

3. Longest Roll: In small groups, try to build a structure using the piece labeled “base” and other marble maze pieces with the goal of keeping the marble rolling in the structure for as long as possible. Use the stopwatch in the kit to time how long it takes for the marble to travel from the start to the base. If the marble stops or falls out at any point, that run does not count and must be restarted.

# Wind-Powered Car

Students will design a car that is propelled by a box fan blowing on a cardboard sail, attempting to design a car that can go as far as possible.

**Time**: ~40 minutes

**Supplies:** box fan, cardboard, dowels (#), wooden wheels (#), pipe cleaners, single hole punch, scissors, masking tape, Sharpie.

**Scientific Concepts:** Wind-assisted propulsion, Form and function

1. Gather some wooden wheels, dowels, and pipe cleaners from the labeled folder. Attach these materials together using pipe cleaners and masking tape.


2. Cut out a cardboard sail of any shape or size. Attach the sail to a car using pipe cleaners and/or masking tape. Use the single hole punch to make holes in the cardboard to feed pipe cleaner through.

3. Place the box fan on one end of the room. Make sure the back of the fan is not against a wall to ensure maximum air flow. Turn the fan on to the fastest setting.

4. Place cars in front of the fan and release it, allowing the wind to propel it forward. Once it comes to a stop, mark where it stopped using masking tape. Label the tape with initials to avoid mixing it up with other student's. If available, the counters in DC28 or the floor in DC10 will provide less friction and in turn, better results.

5. After seeing how far all the cars traveled, take some time to redesign cars to get them to travel further than previous attempts. How can you make your car travel further? Above are some examples of cars that could be made. When finished, take the cars apart and separate the pieces by type.

# Cleanup

- Rinse shaving cream off icing scrapers and place on drying rack (DC21, DC29, DC19).
- Gather and throw away newspaper placed out on tables.
- Throw away materials that cannot be reused (e.g. popped balloons, broken dowels).
- Recycle “wind powered car” cardboard in the bins located in the lobbies of the Discovery Center.
- Take apart any wind powered cars and place items that can be reused back in the folder.
- Students are welcome to take certain items they created.
    - Gliders, balloons and static electricity critters, shaving cream art, UV pen art