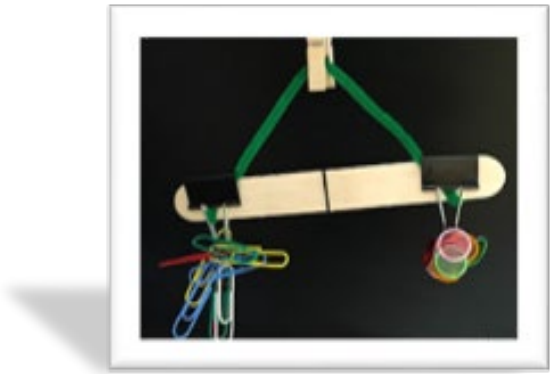
YES!Sparks Challenge Activity Instructions

Activities are designed for youth 8 years of age and older.
Parental guidance is recommended for younger children.

1. Balance Scale
2. Balloon Rocket
3. Catapult
4. Helicopter
5. Paper Circuits
6. Paper Cup
7. Paper Snowflakes
8. Pompom Popper
9. Roll the Dice to Count and Move
10. Rubber Band Harmonica
11. Science Journal Field Notes
12. Shadow Tracing
13. Straw Oboe
14. Sweaty Science- Dance Like a Robot and Take your Pulse
15. Thaumatrope
16. Watercolor Painting – Salt Art
17. Draw a map of your room or dream house
18. Describe an imaginary planet
19. Science Senses Mindfulness
20. Visit a science website
21. Read a book about a female scientist or inventor
22. Read a book about a kid scientist or inventor
23. Read a book about an artist or musician
24. Read an article in a science magazine

1. <u>Balance Scale</u>

Build your own scale and learn about measurement and weight.

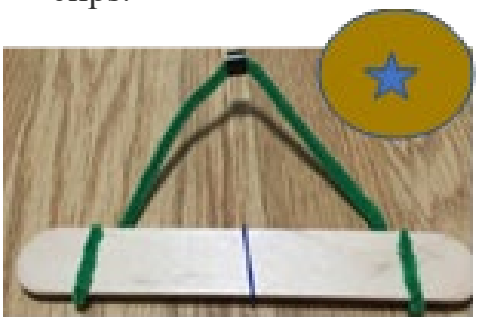


Materials required: 8” craft stick, measuring tape, 2 binder clips, 1 pipe cleaner, 1 big bead, 1 clothespin

Optional: make weighing trays to hang from each binder clip using drink lids and string.

Instructions:

1. Slide the pipe cleaner through the big plastic bead until the bead is in the middle.
2. Use the measuring tape to locate the middle of the craft stick. Mark the midline with a pencil or pen.
3. Hook the pipe cleaner around each end of the craft stick and secure with binder clips.



4. Clamp the clothespin on to the bead.
5. The scale will be balanced when the bead and clothespin are in line with the midpoint of the stick.
6. You can compare the weight of an assortment of objects by connecting them to the binder clips

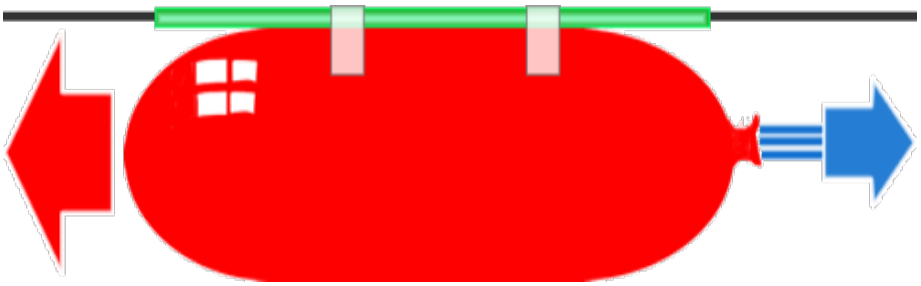
2. <u>Balloon Rocket</u>

Explore motion while making a balloon blast off like a rocket.

Materials required: 1 balloon (cylindrical balloons work best), 1 long piece of kite string (about 10-15 feet long), 1 plastic straw, tape/paper labels

Instructions:

1. Tie one end of the string to a chair, doorknob, or other support.
2. Put the other end of the string through the straw.
3. Pull the string tight and tie it to another support across the room.
4. Blow up the balloon (but don't tie it.) Pinch the end of the balloon and tape the balloon to the straw as shown above. You're ready for launch.
5. Let go and watch the rocket fly!



What's Happening?

It's all about the air...and THRUST. As the air rushes out of the balloon, it creates a forward motion called **THRUST**. *Thrust is a pushing force created by energy*. In this experiment, thrust comes from the energy of the balloon forcing the air out. Different sizes and shapes of balloon will change the amount of thrust. In a real rocket, thrust is created by the force of burning rocket fuel as it blasts from the rocket's engine - as the engines blast down, the rocket goes up!

3. <u>Catapult</u>

A fun way to launch something in the air!
Build a catapult AND learn about science at the same time.

Materials required: 7 jumbo craft sticks, 6 rubber bands, 1 plastic spoon, 1 pom-pom

Instructions:

1. Stack five craft sticks together. Use a rubber band to tightly band both ends, leaving about a 1/2-inch on each side.
2. Secure the two remaining craft sticks together on one end with a rubber band.
3. Slide the stack of 5 between two sticks as close to the band as they will fit.
4. Secure the cross-stack in place with a rubber band, crisscrossing to form an "X" at the center.
5. Attach a plastic spoon to the upper craft stick with the handle of the spoon wedged under the "X" rubber band. Add another rubber band near the bowl end of the spoon.
6. To test your catapult, place the pompom in the bowl of the spoon. Push down on the arm with the spoon. Release quickly to fling the pompom.



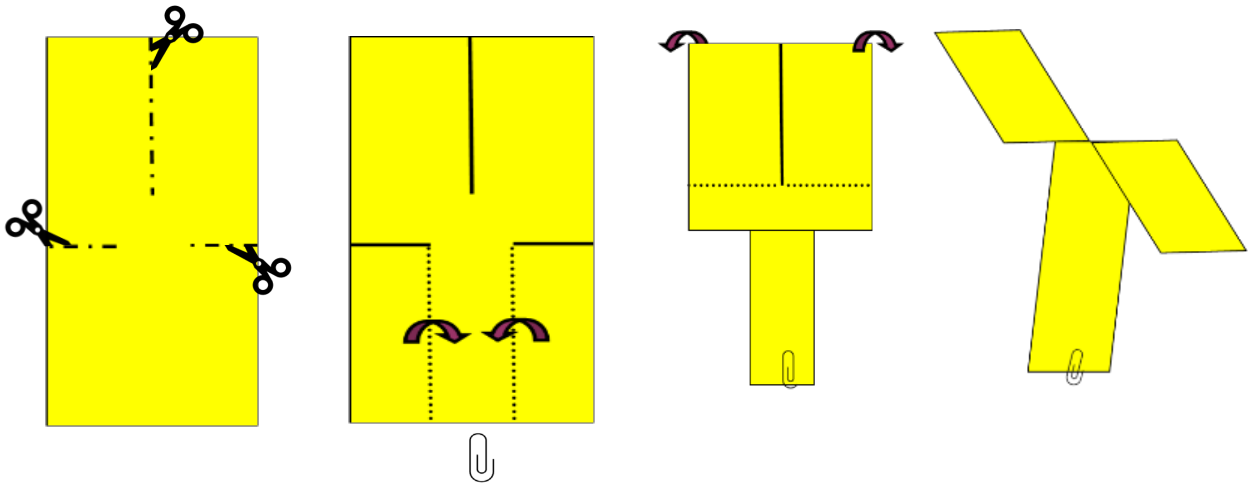
4. <u>Helicopter</u>

Paper helicopters are a fun activity that demonstrates gravity, drag, and thrust.

Materials required: helicopter template, scissors, paperclip

Instructions:

1. Cut template on dotted lines.
2. Fold in flaps to make a stem and secure with a paperclip.
3. Fold propellers in opposite directions.
4. Drop it and watch it spin.

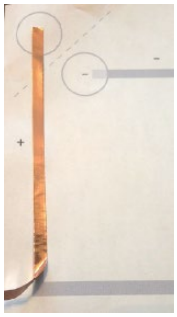


5. <u>Paper Circuits (light-up card)</u>

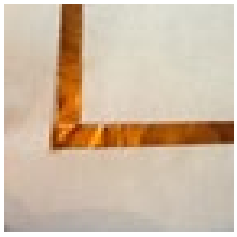
Make simple electrical circuit on a flat piece of paper.

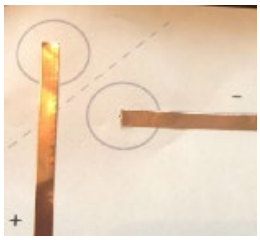
Materials required: circuit template, copper foil tape, coin cell battery, 3 or 5mm LED diode, small binder clip, scotch tape

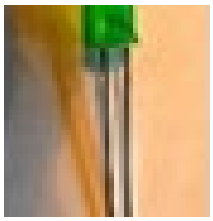
Instructions:

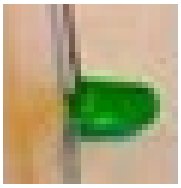


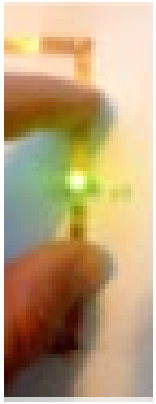
2. Separate the copper foil tape from the white backing paper. Be careful not to allow it to stick to itself.
3. Beginning at the positive (+) battery location, stick the copper tape along the circuit path, working toward the corner. Stop just before the corner. *Do not tear or cut the copper tape; it must remain intact.*











8. Create a small hole at the center of the gap. Thread the diode leads from the outside to the inside of the card. Bend the wires apart so they extend in opposite directions. Position the leads so that they bridge the gap in the circuit. The longer lead (the (+) anode) should be in contact with the positive (+) path, and the shorter lead (the (-) cathode) should be in contact with the negative (-) path. Fix the LED leads to the copper paths with cellophane tape. Make sure the connections are secure.
9. Attach the Battery: On a coin cell battery, one side is positive (+), the other is negative (-). The positive side is labeled with a plus (+) symbol.
10. Place the coin cell battery with the negative side down on the negative battery circle on the template. Tape the battery in place along the edges, making sure to leave the battery face open to contact the copper tape when the circuit is complete.
11. Test the connection: Bend the corner of the circuit template over along the dashed line (-----). When the flap comes in contact with the battery, the circuit

is complete, and the LED should light up*. Use a binder clip to hold the battery in place for a continuous connection.

12. Now it's time to get creative! Once your circuit is functioning and the LED lights up, you can design your card around the light.

13. If the LED does not light up when the circuit is complete, try trouble shooting the following areas:
    - Battery polarity: try flipping over the battery
    - Loose connections: make certain that the leads on the diode and the copper tape are making contact.
    - LED diode alignment: try flipping the connections on the LED leads
    - Breaks in the circuit pathway: small tears or cuts in the copper pathways, can cause a circuit break. Reinforce tears or cuts with small patches of additional copper tape. Additionally, smooth out bumpy corners using your fingernail or straight edge.

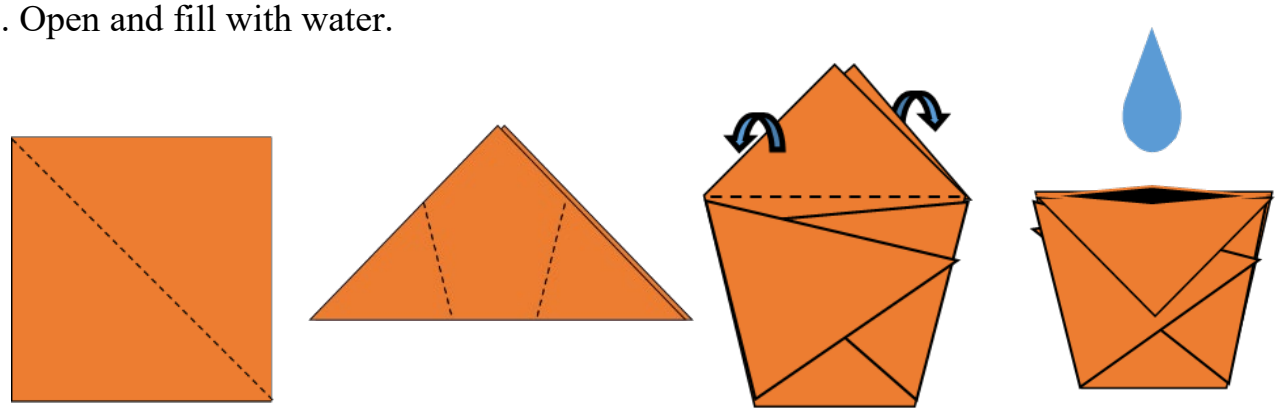
6. Paper Cup

Make a cup out of a single piece of paper.

Materials required: 1 square sheet of paper

Instructions:

1. Fold square paper diagonally.
2. Fold points of triangle across.
3. Split the point at the top. Fold one forward, and one backward.
4. Open and fill with water.



7. Paper Snowflakes

A winter day needs to have the right combination of temperature and humidity to send snowflakes drifting down, but you can create a blizzard at home any time with this activity!

Materials required: scissors, coffee filter

Instructions:

1. Flatten out one coffee filter.
2. Fold it in half into a semicircle.
3. Fold it in half again into a "quarter pizza."
4. Then fold the long edges together one more time, to make a long, narrow, pointed shape like an ice-cream cone.
5. Take your scissors and carefully cut shapes out – diamonds, triangles, moons, circles – along the folded edges, being careful not to cut all the way through to the opposite edge.

Then unfold the coffee filter and feel the chill of your unique, awesome snowflake!

Snowflakes are truly a marvel of science! Snowflakes form when water vapor condenses to ice around a small particle, like a piece of dust, in the atmosphere. Their crystal structure and symmetry, where one side is a mirror image of the other side, develops thanks to the molecular structure of water. Want to know more? https://www.noaa.gov/stories/how-do-snowflakes-form-science-behind-snow

8. <u>Pom-Pom Popper</u>

A fun way to learn about energy and motion.

Materials required: cardboard tube, balloon, rubber band, pom-pom, scissors, small pieces of paper

Instructions:

1. Tie a knot in the end of the balloon.
2. Snip off the top edge of the balloon.
3. Stretch the snipped end over one end of the cardboard tube and secure it with a rubber band (or duct tape).
4. Put the pom-pom in the open end of the tube and let it fall into the balloon.
5. Hold the popper in one hand, pull back on the knotted end of the balloon with your other hand and let that go.

Watch the pom-pom fly out! For even more fun, add pieces of paper to make your own confetti popper! Which travels farther, the pom-pom or the paper?

9. <u>Roll the Dice to Count and Move</u>

Practice counting and adding numbers using the action dice
while having fun with different activities to move your body.

Materials required: dice, wooden dice, marker

Instructions:

1. Write movement activities like jump, dance, or run on the small wooden dice.
2. Roll it along with a pair of dice.
3. Add or subtract the numbers on the dice and do the action displayed on the wooden dice for the number of times displayed.
4. Repeat until you have completed all the activities and have fun!

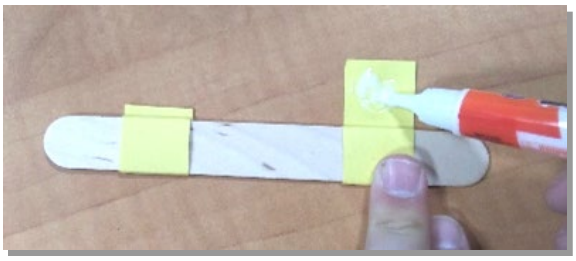
10. Rubber Band Harmonica

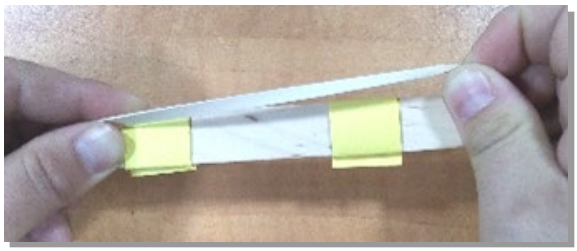
An introduction to vibrations, sound, and the effect of sound on string (rubber band) length.

Materials required: 2 large craft sticks, 3 rubber bands, paper, glue

Instructions:

1. Cut 2 paper strips, about 1 inch thick.
2. Wrap paper strips around craft stick. Secure with glue.
3. Wrap rubber band around craft stick, lengthwise.
4. Stack second craft stick on top and secure with additional rubber bands on each end.
5. Blow through to make music! Move the paper strips back and forth to tune.





11. Science Journal Field Notes

One of the best ways to hone powers of observation and "think like a scientist" is keeping "field notes" in a journal, where you write descriptions or draw pictures of what you see.

Scientists observe and collect data, or information, for many reasons. But observation is much more than looking at an object. It is really studying an object, comparing what you know with what you don't know about it, and asking questions about it.

Materials required: science journal, pencil, an object (or something else to study)

Instructions:

1. Take your science journal and choose something that interests you. It can be a natural object like a rock, a human-manufactured object like a toy, or something you see outside, like a bird or the feel of a cold wind on your hand.
2. Spend a few minutes just studying the item, focusing on its details. Ask yourself questions about it.
3. Then get your journal and pencil and record some thoughts and answers to your questions. Here are some to get you started. If the item you chose was an object, is it heavy or light? What color is it? Can it move or bend? Does the surface feel rough or smooth? For something like wind, was it moving fast or slow? Was it steady, or did it have gusts of differing strengths?
4. Try drawing a picture of the item, and don't worry about capturing every detail; part of observing is focusing on the most important details.

12. Shadow Tracing

Study what happens when light rays strike an object from different angles.

Have you ever watched your shadow move on a sunny day? Or wondered why you couldn't see your shadow on overcast days or in darkness? Shadows occur when light rays cannot get through an object. "Simply speaking, a shadow is an absence of light. If light cannot get through an object, the surface on the other side of that object (for example, the ground or a wall) will have less light reaching it." (https://www.sciencelearn.org.nz/resources/2771-light-and-shadows)

Materials required: paper, pencil, flashlight, an object to trace

Instructions:

1. Choose an object (This could be almost anything: an action figure, a stuffed animal, a cup from the kitchen).
2. Set the paper on a flat surface and set the object on top.
3. Point the flashlight at the object and see if the object's shadow appears on the paper.
4. Once you can see a shadow, trace around its edges.
5. Try moving the flashlight to see if you can change the appearance of the shadow. Trace this new shadow.

How did it change from the first tracing? Can you make the shadow taller or shorter? How else can you distort the shadow's shape? How do you think the position of the light source affects the shadow cast by the object? How detailed is the shadow? For example, if you have chosen to trace a stuffed animal's shadow, does the shadow show the animal's eyes and nose? Why or why not?

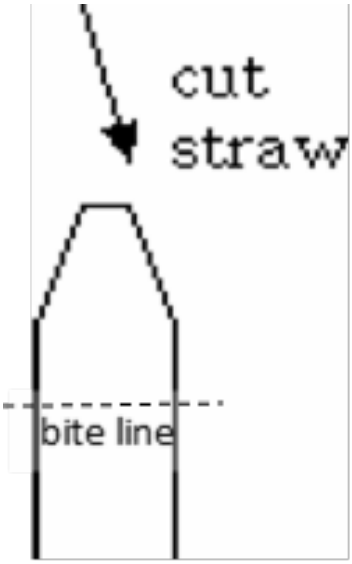
13. Straw Oboe (aka - duck call)

By cutting two "lips" into the flattened end of a soda straw and blowing with just the right pressure, you can make sounds resonate in the straw.

Materials required: plastic drinking straw, scissors

Instructions:

1. Flatten one end of the soda straw by sticking the end in your mouth, biting down with your teeth, and pulling it out. Do this several times to make a flexible, flat-ended straw.
2. Cut equal pieces of straw from each side of the flat region so that the straw has two lips at the end.



To Play:

Put the straw in your mouth, and bite down on it gently with your front teeth just beyond the lips of the straw. Experiment with blowing hard and softly while biting down with different amounts of pressure until you make the straw sing, by vibrating the cut ends together.

14. Sweaty Science- Dance Like a Robot and Take your Pulse

Increasing your heart rate through movement is important for a healthy body because it strengthens your heart and condition your muscles. It also **increases blood flow to the brain**, which helps with focus and staying alert.

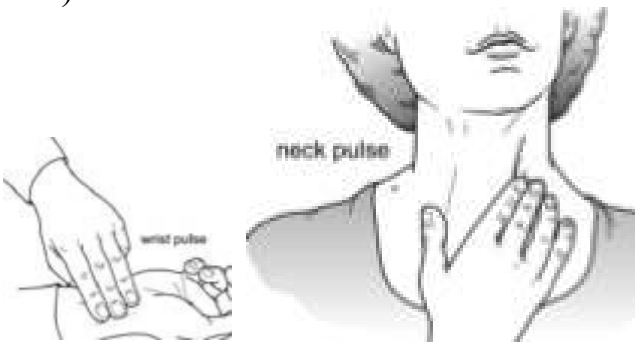
Materials required: a watch or clock with second hand, music

Instructions:

1. Measure your heart rate while resting and write the results in your journal.
2. Put on your favorite song and dance like a robot for the duration of the song.
3. Measure your heart rate after you exercise and write your results in your journal. How does dancing affect heart rate?

How to take your pulse

1. Place the tips of your index, second, and third fingers (do NOT use your thumb) on the palm side of your other wrist, below the base of the thumb. Or place the tips of your index and second fingers on your lower neck, on one side of your windpipe.
2. Press lightly with your fingers until you feel a pulsing beneath your fingers. This pulse is the blood moving inside the vessels beneath your skin. You might need to move your fingers around slightly up or down until you feel the pulsing.
3. Use a watch with a second hand or look at a clock with a second hand.
4. Count the beats you feel for 15 seconds. Multiply this number by four to get your heart rate (pulse).



Your Resting Heart Rate

_____ x 4 = _____

(number of beats in 15 seconds) (your pulse/resting heart rate)

15. Thaumatrope

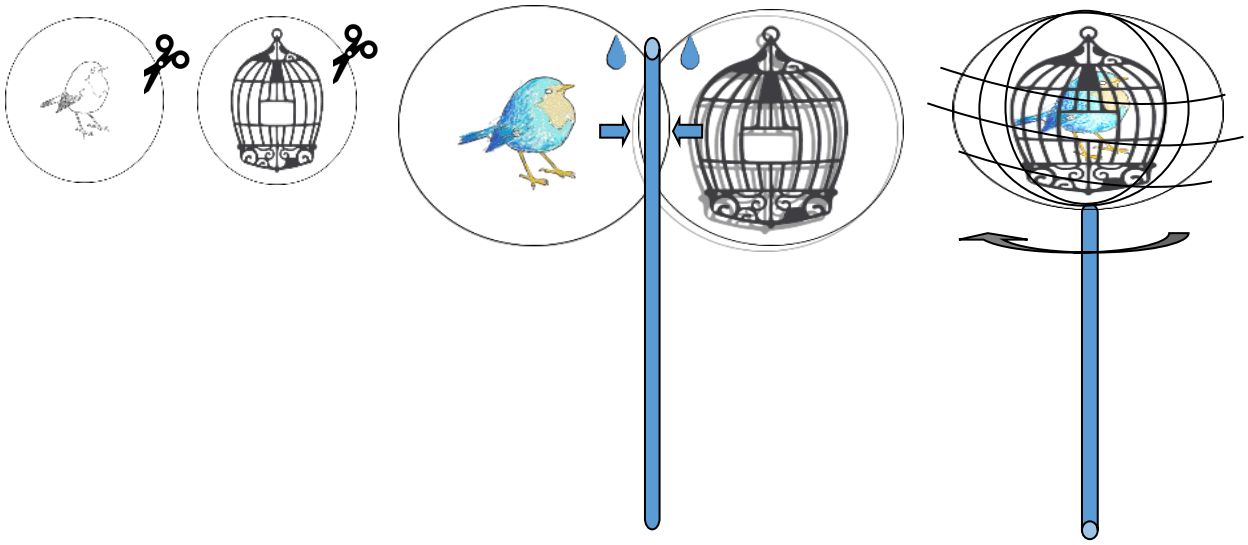
Make your own animation toy and learn about "persistence of vision". When we see an image, the image is held on the retina in our eye for a fraction of a second. A Thaumatrope is also called a "wonder turner" and now you know why!

Materials required: Thaumatrope template, straw, scissors, glue, crayons

Instructions:

1. Cut out circles containing bird and cage. Decorate!
2. Glue bird and cage back-to-back with the straw in between.
3. Once glue dries, spin the straw.

Watch the picture as the bird appears inside the cage!



16. Watercolor Painting – Salt Art

Mix art and science to make a creative and stunning masterpiece while learning how salt interacts with water.

What is the relationship between salt and water? Do they mix together? Would salt water be a good thing to drink if you were thirsty? Why do salty things make you thirsty? Did you know that salt is a ***hygroscopic substance***? This activity shows that salt attracts water molecules from the surrounding environment. In this project you will see some of the water in your watercolor painting absorbed into the salt and how it leaves behind a unique texture.

Materials required: watercolor paper, watercolor paint, paint brush, salt, cup of water

Optional: clothing cover, table cover (like newspaper)

Instructions:

1. Add a few drops of water to each water-color disk. Keep adding water as needed.
2. Paint a picture until there is virtually no blank space left on the paper, also make sure the paint is still wet and sprinkle salt on the painting. You can also sprinkle salt after you paint small portions if the paint is drying too quickly.
3. Allow your painting to completely dry.

17. Draw a map of your room or dream house

Just for fun, and to learn about spatial literacy, draw a map of your room and then use your imagination to draw a map of your dream house. What kind of inventions will there be in the future that you might have in your dream house?

18. Describe an imaginary planet

Pretend you just discovered a new planet. How does it compare to planet Earth? How is it different? Draw a picture of what it looks like. Now imagine going on an expedition to find life forms. What do you find? Draw a picture of what you find. Explain how you would interact with them.

19. Science Senses Mindfulness

Practice a mindfulness exercise:

1. Sit comfortably and close your eyes. Take a few deep breaths.
2. For 30 seconds, focus deeply on what you can hear. Even the smallest noises.
3. For 30 seconds, focus deeply on what you can smell.
4. For 30 seconds, focus deeply on what you can feel.
5. Open your eyes and look up. For 30 seconds, focus deeply on what you can see.

20. Visit a science website

Visit a kid friendly science website and explore a topic that interests you:

- nasa.gov/kidsclub
- discoverymindblown.com (Kids content from the Discovery Channel)
- kids.nationalgeographic.com
- sciencekids.co.nz
- billnye.com
- climatekids.nasa.gov
- dkfindout.com/us/
- airandspace.si.edu (Smithsonian National Air & Space Museum)
- pbskids.org/scigirls/
- amnh.org/explore/ology (American Museum of Natural History science)

Reading Activities

Do you want to learn more about a scientist, inventor, artist, or musician? Pick a reading activity and remember you can always ask a librarian to help you find a great book or article.

21. Read a book about a female scientist or inventor

22. Read a book about a kid scientist or inventor

23. Read a book about an artist or musician

24. Read an article in a science magazine

Find a topic that interests you in a science magazine like: *National Geographic, National Geographic Kids, Popular Science, Smithsonian, Ranger Rick, Zoobooks.*