summer activity guide

Invention & Imagination

ages 5–9

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About the Summer Activity Guides

Summers are for fun and engaged learning. In 2020 as the impact of the pandemic is widely felt, summer opportunities will be different for young people, families, and afterschool and summer program staff. The Summer Activity Guides were developed to help engage youth with supportive adults in a range of places.

The activities and resources in the Summer Activity Guides are intentionally designed to support youth-serving summer programs in driving consistent engagement and providing ongoing opportunities for youth skill-building and emotional well-being. In addition to the activities for youth, supplemental materials will be available to support professional development and enhance family engagement.

The Guides include 150 original activities and challenges organized by four different age groups (5-9) (10-12) (13-15) (16-18). The activities are adaptable for in-person and virtual instruction, or a hybrid of both, as well as sent as take-home packets.

All activities should be safely executed and aligned with state and local health guidelines.

Tinfoil Boats

CHALLENGE DESCRIPTION

In this STEM challenge, youth will try to build a boat that holds 25 pennies out of tin foil. As part of the 'Invention & Imagination' unit, this engineering and physics experiment is designed to introduce youth to the concept of buoyancy. This activity encourages the development of STEM literacy, problem-solving, creativity and critical thinking skills.

SUPPLIES

- Large bowl of water (or a sink or bathtub)
- 40 pennies
- Aluminum foil
- [Optional] Blue or green food coloring
- Tinfoil Boats Handout

STEPS

- Your challenge today is to use aluminum foil to build a boat that can hold 25 pennies without sinking.
- Fill your bowl, sink or bathtub ¾ with water. See Step 1 in the handout. [Optional: Add a few drops of green or blue food coloring to the water.]
- Set out a sheet of aluminum foil. Place 15 pennies on top of the sheet. Ball up the sheet around the pennies.
- Place the balled-up aluminum foil with pennies in the water. What happens? Does it float or sink? It sinks!
- Now, let's build a boat. Cut 2 squares of aluminum foil. Each should be around 8 inches long and 8 inches wide.
- Use 1 square of aluminum foil to build a boat that floats in the water. See Step 2 in the handout. Experiment with different shapes. If it doesn't float the first time, try again with a new sheet of aluminum foil.
- Now set your boat in the water. Why does your boat float? Your boat floats because it is buoyant. Buoyancy is how well something floats in water or in another liquid.
- Slowly add one penny at a time to your boat. See Step 3 in the handout. What do you think will happen? How many pennies can your boat hold before it sinks?
- If your boat sinks, take a new sheet of aluminum foil and try to build a boat that can hold even more pennies.
- Continue to experiment with your boat's design until you've built a boat that can hold 25 pennies without sinking.
- Why did your ball of pennies sink but your boat with pennies did not? The big difference is the size. The ball of foil and pennies is smaller and takes up less room so there is not a lot of force pushing up to keep it floating. The boat takes up more space so it has more force pushing up on it.

ADAPTATIONS

- If you are delivering the challenge virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you. If you are not able to send home the supplies, youth can watch the facilitator do the demonstration. Be sure to pause throughout for questions and discussion.
- If you are delivering the challenge digitally or through take-home packets, have youth share photos or videos of their boats to your program platform.
- For virtual and in-person delivery, have images of different items and have kids make predictions (e.g., bucket, other boats, blocks, etc.). Will this float? Why or why not?

EXTENSIONS

- Build boats that float using lots of different materials. Check out the following link for an activity plan: https://www.scholastic.com/teachers/articles/teaching-content/activity-plan-5-6-build-boat-floats/
- To learn more and experiment with buoyancy, try the 'Simple Saltwater Density Experiment' available at: https://littlebinsforlittlehands.com/simple-salt-water-density-science-experiment-saturday-science/

CREDITS: Little Bins for Little Hands' 'Penny Boat Challenge' available at https://littlebinsforlittlehands.com/penny-boat-challenge/

Tinfoil Boats Handout

Step 1: Fill your bowl, sink or bathtub ¾ with water. Set out a sheet of aluminum foil. Place 15 pennies on top of the sheet. Ball up the sheet around the pennies. Place the balled-up aluminum foil with pennies in the water.

Step 2: Use 1 square of aluminum foil to build a boat that floats in the water.

Step 3: Slowly add one penny at a time to your boat. See how many pennies you can add until it sinks.

Build a Catapult

ACTIVITY DESCRIPTION

In this STEM activity, youth will build their own catapult using Popsicle sticks and then use it to fire small objects. As part of the 'Invention & Imagination' unit, this engineering and physics experiment is designed to get youth excited about simple machines. This activity encourages the development of STEM literacy, inquiry, creativity and critical thinking skills.

SUPPLIES

- 10 jumbo Popsicle sticks
- 5 rubber bands
- Plastic spoon
- Marshmallows, small erasers, pom poms or other small objects
- Build a Catapult Handout

STEPS

- Take 8 Popsicle sticks and stack them on top of one another. Wrap a rubber band around each end of your stack. See step 1 on the handout. You may need an adult's help to wrap the rubber band tightly.
- Take another one of your sticks and push it through the stack just below the top stick. See step 2 on the handout. Here is a video of how to do this: https://littlebinsforlittlehands.com/popsicle-stick-catapult-kids-stem-activity/?jwsource=cl
- Flip your stack over so that the Popsicle stick that you just pushed through is on the bottom of the stack.
- Put a second stick on top of your stack and wrap a rubber band around the bottom of the 2 Popsicle sticks. See step 3 on the handout.
- Place your spoon, facing up, on top of the stick that is on top. Wrap a rubber band around the bottom to attach the spoon to the stack and another rubber band around the top. See step 4 on the handout.
- Push the stack of Popsicle sticks towards the ends with the part connected by the rubber bands.
- Your catapult is complete! Now try it out. Hold a marshmallow (or other small object) in the scoop of the spoon. Press down on the spoon and then let go. Watch your marshmallow shoot into the sky!
- Try shooting each of your small objects from your catapult to see which one goes the farthest.

ADAPTATIONS

- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate.

EXTENSIONS

- Use a measuring tape to see which items flew the farthest. Measure and record all of the launches.
- Test out the number of Popsicle sticks used in the stack. What happens if you use 6 or 10 instead of 8?
- Try making different types of catapults. See which one works better. Here's how to make a Lego catapult: https://littlebinsforlittlehands.com/easy-lego-catapult-and-tension-experiment-for-kids/ and here is how to make a catapult with toothpicks: https://littlebinsforlittlehands.com/easy-marshmallow-catapult-activity/

QUESTIONS FOR DISCUSSION

- What type of machine is a catapult? It's a lever. When you pull down on the arm of the lever all of the energy gets stored up and then when you release it, the energy shoots the object into the air.
- What other levers have you seen?
- Which item will go the farthest? Why do you think that item will go the farthest? Come up with a hypothesis (a guess).
- Try firing different objects. Which item worked the best? Did any objects not work at all? Why?

CREDITS: Little Bins for Little Hands' 'Popsicle Stick Catapult' available at https://littlebinsforlittlehands.com/popsicle-stick-catapult-kids-stem-activity/

Build a Catapult Handout

Step 1: Take 8 Popsicle sticks and stack them on top of one another. Wrap a rubber back around each end of your stack.

Step 2: Push one of the sticks through the stack just below the top stick.

Step 3: Put a second stick on top of your stack and wrap a rubber band around the bottom of the 2 Popsicle sticks.

Step 4: Place your spoon, facing up, on top of the stick that is on top. Wrap a rubber band around the bottom to attach the spoon to the stack and another rubber band (or tape) around the top.

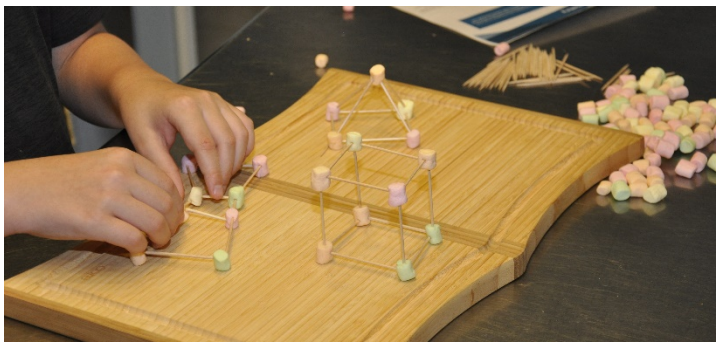
Marshmallow & Toothpick Shapes

ACTIVITY DESCRIPTION

In this STEM activity, youth will build geometric shapes using marshmallows and toothpicks. As part of the 'Invention & Imagination' unit, this hands-on math activity is designed to help youth explore 2-dimensional structures. This activity encourages the development of basic geometry skills, problem-solving skills, and creativity.

SUPPLIES

- 50 toothpicks
- 50 small marshmallows
- Copy of the '2D Geometric Shapes with Marshmallows and Toothpicks' available here: https://members.teachbesideme.com/wp-content/uploads/2017/06/Marshmallows-and-Toothpicks-book.pdf



STEPS

- In this activity you are going to try to build shapes using marshmallows and toothpicks. You will need your marshmallows to do the activity so make sure you don't eat them until the activity is over!
- Set out your marshmallows and toothpicks. Look at the 'Build 2D Geometric Shapes' Activity Cards. Each card shows you how many marshmallows and how many toothpicks you will need to build the shape.
- Find the first card, 'Build a Square'. The card shows that you will need 4 toothpicks and 4 marshmallows to make a square. Use your marshmallows and toothpicks to try to make a square, just like the picture on the card.
- Does your shape look like the picture on the card? After you have finished, set that shape aside and pick up the next card and try to build the shape in the picture.
- See if you can build all 10 shapes on the 2D cards.

ADAPTATIONS

- This activity is best completed over multiple sessions. Youth can build a few shapes in each session. Consider starting with the more simple and familiar shapes first (like a square or triangle).
- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you.

EXTENSIONS

- Build letters and words.
- Build a house, a building in your neighborhood, or a playground.
- Try doing the 'Famous Towers' challenge in this unit by using only marshmallows or toothpicks.
- Try using different materials to build shapes and structures like spaghetti and marshmallows, boxes, index cards or playing cards, etc.

QUESTIONS FOR DISCUSSION

- What was your favorite part of the activity and why?
- What challenged you the most?
- Were there any new shapes that you learned about from this activity?
- What shapes do you see around your home and neighborhood that you could try to build?

CREDITS: Teach Beside Me's 'Building 2D and 3D Geometric Shapes with Marshmallows and Toothpicks' available at https://members.teachbesideme.com/wp-content/uploads/2017/06/Marshmallows-and-Toothpicks-book.pdf

Chromatography

ACTIVITY DESCRIPTION

In this STEM activity, youth will use everyday objects to conduct a simple chemistry experiment. As part of the 'Invention & Imagination' unit, this is designed to introduce youth to the process of chromatography. This activity encourages the development of STEM literacy, inquiry and critical thinking skills.

SUPPLIES

- Black washable marker (black Crayola washable or black Expo)
- 1 paper towel
- Scissors
- 5 cups
- Water
- Piece of paper
- Chromatography Handout

STEPS

- Chromatography is a process that scientists use to separate mixtures.
- Cut your paper towel into 5 strips (long pieces). See step 1 in the handout.
- Use your black marker to color the center of each strip of paper towel (about the size of a quarter or 1 inch). See step 2 in the handout.
- Put a small amount of water in the bottom of each of your 5 cups (about 1 inch of water). See step 3 in the handout.
- Fold each of your 5 strips of paper towel in half with the part that you colored at the fold.
- Put 1 piece of paper towel in each cup with the colored center in the water. Let the ends of the strips hang over the sides of the cups. See step 4 in the handout.
- Watch what happens!
- Let the paper towels stay in the cups for a few minutes. Then, take them out and lay them flat on a piece of paper to dry. See step 5 in the handout.
- Look at your paper towels. What colors is black ink made of?

ADAPTATIONS

- If you are delivering this activity digitally, create a log on your program page where youth can post their observations.
- If you are delivering the activity via take-home packets or digitally, encourage parents or caregivers to be involved so that youth can discuss the questions and their observations with someone.

EXTENSIONS

- Try this same experiment with other marker colors or other types of liquid.
- Try this experiment with a permanent marker (like a Sharpie) instead of a washable marker. Once you have colored the paper towel with the marker, add a few drops of rubbing alcohol. Watch what happens.
- Try this same experiment using a coffee filter: https://www.exploratorium.edu/science_explorer/black_magic.html

QUESTIONS FOR DISCUSSION

- What did you think was going to happen when you put the paper towel in the cup of water?
- What happened? The ink from the marker started moving up the paper towel and the colors started to separate into parts. This is called capillary action
- What surprised you?
- What colors is black ink made of? Black ink is made of a lot of different colors. These are called pigments.
- Why do you think the colors separated on the paper towel? The water separated the black ink into its parts (components) by carrying it through the paper towel. This is called chromatography. (For a more in-depth description of chromatography, check out: https://www.explainthatstuff.com/chromatography.html)

CREDITS: Babbledabbledo's 'The Classic Chromatography Experiment' available at https://babbledabbledo.com/how-to-do-the-classic-chromatography-experiment/

Chromatography Handout

Step 1: Cut your paper towel into 5 strips (long pieces).

Step 2: Use your black marker to color the center of each strip of paper towel.

Step 3: Put a small amount of water in the bottom of each of your 5 cups (about 1 inch of water).

Step 4: Put a small amount of water in the bottom of each of your 5 cups (about 1 inch of water).

Step 5: Let the paper towels stay in the cups for a few minutes. Then, take them out and lay them flat on a piece of paper to dry.

Look at your paper towels. What colors is black ink made of?

Tie-Dye T-Shirt

ACTIVITY DESCRIPTION

In this art and STEM activity, youth will create a tie-dye t-shirt using permanent markers and rubbing alcohol. As part of the 'Invention & Imagination' unit, this experiment is designed to introduce youth to soluble science. This activity encourages the development of inquiry, creativity and critical thinking skills.

SUPPLIES

- 1 plain, white cotton t-shirt
- 1 piece of cardboard (about the size of a piece of printer paper)
- Permanent markers (different colors)
- Rubbing alcohol
- Eyedropper/pipette/or recycled condiment bottle

STEPS

- [Note: This activity uses rubbing alcohol, which is can be harmful if ingested. You will need an adult to help.]
- Have you noticed when water drops on paper with words on it, sometimes the ink runs? This is because the ink has combined with the water and as the water moves it carries the ink with it. This is called "solubility". In this activity, we will learn more about solubility by making tie-dye t-shirts.
- To create your tie-dye t-shirt, insert a piece of cardboard into the t-shirt to prevent the colors from bleeding through to the other side.
- Pick the permanent marker colors you want to use.
- Use your markers to draw small simple patterns all over your shirt. For example, to make a flower you can make a large dot in one color and then smaller dots around the large one in a different color. Or you can draw a heart of fireworks shapes.
- Ask an adult to add rubbing alcohol to the eyedropper.
- Slowly drip the rubbing alcohol onto the center of your design.
- Once you have finished designing your t-shirt. Let it dry completely. (Note: Ask an adult to iron your shirt or throw it in the dryer to make sure the design stays put.)

ADAPTATIONS

- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you.
- If you are delivering the activity via take-home packets or digitally, encourage youth to upload photos of their design on your organization's online platform or social media.

EXTENSIONS

- To create other chemical reactions, try the 'Fizzy Dough' or 'Fizzy Painting' activities and extensions.
- If you have an extra t-shirt, try it again. This time draw something new with your permanent markers and/or change how much rubbing alcohol you use.
- Try using a different piece of clothing or cloth, like a mask, sock or kitchen towel.
- Make a shirt for a loved one and invite your whole family to participate.

QUESTIONS FOR DISCUSSION

- What happened to your design when you added 1 drop? What happened when you added more drops?
- When the colors mix together, what happens?
- Do you think water would work as well as rubbing alcohol? Why or why not?

CREDITS: Playdough to Plato's 'Sharpie Tie-Dye Science' available at https://www.playdoughtoplato.com/sharpie-tie-dye-science/

Fizzy Painting

ACTIVITY DESCRIPTION

In this art and STEM activity, youth will create a 'fizzy painting'. As part of the 'Invention & Imagination' unit, this experiment is designed to introduce youth to chemical reactions. This activity encourages the development of inquiry, creativity and critical thinking skills.

SUPPLIES

- Watercolor paper (or use a thick, heavy paper)
- ½ cup of baking soda
- Vinegar (less than ½ cup)
- A squeeze bottle / recycled condiment bottle (ex. an old mustard bottle) / pipette
- Food coloring (multiple colors)
- Fizzy Painting Handout

STEPS

- In this activity, you will create a chemical reaction by making a fizzy painting. A chemical reaction is when two or more ingredients are mixed together and then each ingredient breaks apart into smaller pieces to form something new.
- Find a space where it's okay to get a little messy or somewhere that is easy to clean.
- Sprinkle ½ cup of baking soda on watercolor paper.
- Add 1 tablespoon of vinegar to your squeeze bottle or pipette.
- Add 2–3 drops of food coloring to the squeeze bottle or pipette.
- Use the squeeze bottle or pipettes to drop the colored vinegar onto the watercolor paper.
- Wash out or use a different squeeze bottle or pipette. Add a different color. Repeat until you are finished with your painting.
- Once your paper has dried, scrape off the leftover baking soda.
- You just saw a chemical reaction between baking soda and vinegar. When you added the vinegar, it created the fizzy reaction and formed a gas and a liquid.

ADAPTATIONS

- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you. If you are not able to send home the supplies, youth can watch the facilitator conduct the experiment. Be sure to pause throughout for questions and discussion.
- If you are delivering the activity via take-home packets or digitally, encourage parents or caregivers to be involved so that youth can discuss the questions and their observations with someone.

EXTENSIONS

- Do the experiment over again, but this time change one part (variable) of the experiment. For example, what happens when you add more or less baking soda?
- Try another chemical reaction. Make rainbow lightning art using magnets. Find out how to do it here: https://taminglittlemonsters.com/rainbow-lightning-process-art-for-kids/. Or, try 'Water and Oil Droplet Paintings', like the one found here: https://stayathomeeducator.com/oil-and-water-droplet-painting-process-art-activity/

QUESTIONS FOR DISCUSSION

- What do you think will happen when you add vinegar to the baking soda? What is your hypothesis (guess)?
- What happens to the paper? Why do you think this happened?
- What happened when you mixed the colors?

CREDITS: Taming Little Monsters 'Fizzy Painting' available at https://taminglittlemonsters.com/fizzy-painting-stem-activity-for-kids/

Fizzy Painting Handout

Step 1: Sprinkle ½ cup of baking soda on watercolor paper.

Step 2: Add 1 tablespoon of vinegar to your squeeze bottle or pipette.

Step 3: Add 2 – 3 drops of food coloring to the squeeze bottle or pipette. Use the squeeze bottle or pipettes to drop the colored vinegar onto the watercolor paper.

Step 4: Wash out or use a different squeeze bottle or pipette. Add a different color. Repeat until you are finished with your painting. Once your paper has dried, scrape off the leftover baking soda.

Fizzy Dough

ACTIVITY DESCRIPTION

In this STEM activity, youth will create 'fizzy dough'. As part of the 'Invention & Imagination' unit, this experiment is designed to introduce youth to chemical reactions. This activity encourages the development of STEM literacy, inquiry, creativity and critical thinking skills.

SUPPLIES

- 1 small box of baking soda (approximately 2 cups)
- 1/3 cup white hair conditioner
- 1 cup of Vinegar
- 2-3 squeeze bottles/ recycled condiment bottles/ pipettes
- Food coloring
- Fizzy Dough Handout

STEPS

- A chemical reaction is when two or more ingre dients are mixed together and then each ingredient breaks apart into smaller pieces to form something new. In this activity, you will create a chemical reaction by making fizzy dough.
- To create fizzy dough, add 1 small box of baking soda (2 cups) into a large bowl.
- Add 1/3 cup of conditioner to the bowl of baking soda and stir.
- Mix the dough with your hands until it feels soft and crumbly.
- Put the dough on a plate or small tray. Using your hands, create different shapes with the dough. Or you can use molds or cookie cutters to create the shapes.
- Fill the squeeze bottle or pipette with vinegar. Add 3 drops of food coloring to the bottle. Shake the bottle to mix all the ingredients.
- What do you think will happen when you add vinegar to the dough?
- Squeeze the vinegar onto your dough shapes.
- What happens to the dough?
- Why do you think this happened?
  You just saw a chemical reaction between baking soda and vinegar. When the two came together, they created carbon dioxide, which creates the fizzy bubbles.

ADAPTATIONS

- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you. If you are not able to send home the supplies, youth can watch the facilitator conduct the experiment. Be sure to pause throughout for questions and discussion.
- If you are delivering the activity via take-home packets or digitally, encourage parents or caregivers to be involved so that youth can discuss their observations with someone.

EXTENSIONS

- Do the activity over again, but this time use shampoo instead of conditioner. What do you think will happen?
- Use 3 bottles and add yellow, red and blue food color each. Add each color to your dough, and then mix to form new colors.
- Add vinegar to other dough recipes to see which ones create a chemical reaction.

QUESTIONS FOR DISCUSSION

- What did you think would happen when you add vinegar to the dough? And then, what happened to the dough? Why do you think this happened?
- What other chemical reactions can you think of? Why do some things react but not others?

CREDITS: Babbledabbledo's 'Fizzy Dough' available at https://babbledabbledo.com/how-to-make-fizzy-dough/

Fizzy Dough Handout

Step 1: Add the ingredients. Add 1 small box of baking soda (2 cups) into a large bowl. Add 1/3 cup of conditioner to the bowl of baking soda, and stir. Mix the dough with your hands until it feels soft and crumbly, like snow.

Step 2: Put the dough on a plate or small tray. Using your hands, create different shapes with the dough. Or you can use molds or cookie cutters to create the shapes

Step 3: Fill the squeeze bottle or pipette with vinegar. Add 3 drops of food coloring to the bottle. Shake the bottle to mix all the ingredients. Squeeze the vinegar onto your dough shapes.

Make It Bounce

ACTIVITY DESCRIPTION

In this STEM activity, youth will create bouncy balls. As part of the 'Invention & Imagination' unit, this experiment is designed to introduce youth to polymer science and chemical reactions. This activity encourages the development of STEM literacy, inquiry and critical thinking skills.

SUPPLIES

- 2 tablespoons of white glue
- 2 tablespoons of warm water
- 2 teaspoons of cornstarch
- 1 teaspoon of Borax
- Food coloring
- 2 cups, 2 spoons, and measuring spoons

STEPS

- [Note: This activity uses Borax, which is an eye irritant. You will need an adult to help.]
- In this activity, we are going to make our own polymer. "Polymers" are big molecules made of smaller molecules that are stuck together like blocks. (Think of a chain of paper clips.) A molecule is the smallest material that can exist. Paper, plastic and gum are all polymers.
- To make our polymer, first, get out 2 cups.
- In your first cup, mix 1 teaspoon of Borax with 2 tablespoons of warm water. Stir until the Borax is part of the water (dissolved). (Note: wash your hands after using Borax)
- In your second cup, mix 2 tablespoons of white glue with 2 teaspoons of cornstarch. Add 2 -3 drops of food coloring and stir together.
- Add your mixture from the first cup (dissolved Borax) to the second cup (glue/cornstarch). Stir together.
- Once the mixture becomes impossible to stir, take it out of the cup and mix it together with your hands (like a pizza dough). After mixing, roll it between your palms to make a ball. Make sure to keep pushing hard. (Note: this will be messy, and that's the fun part!)
- Now your ball should be ready to bounce.

ADAPTATIONS

- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you.
- If you are delivering the activity via take-home packets or digitally, encourage parents or caregivers to be involved so that youth can discuss the questions and their observations with someone.

EXTENSIONS

- Polymers can also be used in baking, like bread! Try to make your own magic dough: https://www.scientificamerican.com/article/make-your-own-magic-dough/
- Try a different experiment using a different kind of polymer – a gummy bear! In this experiment you will see what happens to gummy bears when you mix it with water. Here is the activity: https://www.pslc.ws/macrog/kidsmac/activity/bear.htm

QUESTIONS FOR DISCUSSION

- What did you think would happen when you mixed your first cup with your second cup?
- Why do you think the ball bounces? (The ball bounces because the polymer chain changes shape when it hits the floor, which makes it bouncy)
- Does it bounce better on carpets or hard surfaces?
- What other polymers can you think of that are bouncy and stretchy? What do they have in common?

CREDITS: Babbledabbledo's 'DIY Bouncy Balls' available at https://babbledabbledo.com/simple-science-experiment-diy-bouncy-balls/

Lava Lamps

ACTIVITY DESCRIPTION

In this STEM activity, youth will create a layered 'lava lamp'. As part of the 'Invention & Imagination' unit, this experiment is designed to introduce youth to the density of liquids. This activity encourages the development of STEM literacy, inquiry, creativity and critical thinking skills.

SUPPLIES

- Large jar or bottle (e.g., soda bottle)
- Cookie sheet
- ¼ cup of corn syrup
- ½ cup of water
- Food coloring
- ½ cup of oil
- Measuring cups
- 1 Alka Seltzer tablet
- [Optional] Scientific Method sheet to record the steps and observations of the experiment: https://docs.google.com/file/d/0Bxq0hYp2IyG1QWVzQTIycG1KbGs/edit?pli=1

STEPS

- [Note: this activity includes an Alka Seltzer tablet and is best done with adult supervision and support.]
- Set your cookie sheet out on a table and place your jar in the middle of it. This will help with anything that may spill.
- Measure about ¼ cup of corn syrup and pour it into the jar.
- Measure about ½ cup of water and add it to your jar.
- Add 3 drops of food coloring.
- Measure ¼ cup of oil and add it to the jar. If your jar is not very full, you can add another ¼ cup of oil. Leave a little room at the top of your jar.
- Add 1 Alka Seltzer tab to your jar. Watch what happens! It creates bubbles like a lava lamp.
- Put the top back on your jar.

ADAPTATIONS

- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you.
- If you are delivering the activity via take-home packets or digitally, encourage parents or caregivers to be involved so that youth can discuss the questions and their observations with someone.

EXTENSIONS

- Use different liquids to make another jar. Try using honey, light corn syrup, dish soap, olive oil, rubbing alcohol and water. Which liquids are denser and go to the bottom of the jar?
- Try making a rainbow density jar. Check out the following link for a step-by-step: https://www.playdoughtoplato.com/rainbow-jar/

QUESTIONS FOR DISCUSSION

- What do you think will happen when you add the different liquids to the jar?
- What happens when you add each of the liquids to your jar? They separate and become layered in the jar.
- Why do you think the liquids are separating and becoming layered? The liquids separate because they have different weights. Density describes how heavy a liquid is.
- What other liquids might have different densities?
- What happened when you added the Alka Seltzer tablet? Why do you think that happened? When you added the tablet, it started dissolving and creating a gas.

CREDITS: Babbledabbledo's 'How to Do the Classic Layered Liquids Science Project available at https://babbledabbledo.com/science-for-kids-layered-liquids/

Lemon Volcano

ACTIVITY DESCRIPTION

In this STEM activity, youth will use a lemon to make a volcano that erupts. As part of the 'Invention & Imagination' unit, this chemistry experiment is designed to build wonder and excitement while introducing youth to a chemical reaction that creates carbon dioxide. This activity encourages the development of STEM literacy, inquiry, creativity, and critical thinking skills.

SUPPLIES

- 2 lemons cut in half
- ½ cup baking soda
- Food coloring
- Dawn dish soap
- Plate or tray
- Small cup
- Spoon
- Lemon Volcano Handout

STEPS

- [Note for adults: Cut both lemons in half.]
- Squeeze 2 of your lemon halves into a small cup so that you have extra lemon juice.
- Place half a lemon on a plate or a tray. This will prevent a mess when the volcano erupts.
- Use the handle of your spoon to poke holes in the different sections of the lemon. See step 1 on the handout.
- Put a few drops of food coloring around the different sections of the lemon. You can use just one color or different colors. See step 2 on the handout.
- Pour some Dawn dish soap over the top of the lemon. See step 3 on the handout.
- Use a spoon to sprinkle baking soda over the top of the lemon. See step 4 on the handout. Save a little bit of your baking soda to add later. You can also use the handle to push some of the baking soda into sections of the lemon to help your eruption along.
- It will take a few minutes for the reaction to begin and your volcano to start to erupt.
- As it begins to erupt, you can use the handle of your spoon to push more of the baking soda into the lemon.
- After the first eruption has stopped, you can add more baking soda and pour your extra lemon juice on top to continue the reaction.

ADAPTATIONS

- If you are delivering the activity virtually, send home a kit with the activity supplies so that youth are all able to participate in the experiment alongside you. If you are not able to send home the supplies, youth can watch the facilitator do the demonstration. Be sure to pause throughout for questions and discussion.

EXTENSIONS

- Try doing the same experiment with other citrus fruits like limes, oranges, and grapefruits. Which fruit has the biggest eruption?
- Try doing the same experiment with other materials. What happens if you use white vinegar instead of detergent, generic brands of dish soap instead of Dawn?
- Check out the short film 'Working as a Volcanologist': https://www.youtube.com/watch?v=ADnh2FcZwLg

QUESTIONS FOR DISCUSSION

- What do you think will happen when you add the dish soap and baking soda to the lemon? Come up with a hypothesis (a guess).
- What happened when you added the baking soda to your lemon?
- What surprised you?
- What makes the lemon volcano erupt? The citric acid from the lemon juice reacts with the baking soda and creates carbon dioxide, which is a gas. The bubbling and fizzing that you see is the carbon dioxide.
- What did you like about the activity?
- What challenged you?
- What do you want to learn more about?

CREDITS: Little Bins for Little Hands' 'Erupting Lemon Volcano' available at https://littlebinsforlittlehands.com/erupting-lemon-volcano-chemistry/

Lemon Volcano Handout

Step 1: Use the handle of your spoon to poke holes in the different sections of the lemon.

Step 2: Put a few drops of food coloring around the different sections of the lemon. You can use just one color or different colors.

Step 3: Pour some Dawn dish soap over the top of the lemon.

Step 4: Use a spoon to sprinkle baking soda over the top of the lemon.

The 50 State Afterschool Network

The Summer Activity Guide has been developed for the 50 State Afterschool Network with leadership from the Georgia Statewide Afterschool Network to engage and support children and youth nationwide.

In each state, the afterschool network is broadening opportunities for youth. Seeking equitable outcomes for underserved children to succeed in school and future jobs, a statewide afterschool network brings together cross-sector leaders with a common vision and coordinated strategy to advance quality afterschool and summer learning programs

Alabama Afterschool Community Network
Alaska Afterschool Network
Arizona Center for Afterschool Excellence
Arkansas Out of School Network
California AfterSchool Network
Colorado Afterschool Partnership
Connecticut After School Network
Delaware Afterschool Network
Florida Afterschool Network
Georgia Statewide Afterschool Network
Hawai'i Afterschool Alliance
Idaho Afterschool Network
Afterschool for Children and Teens Now (ACT Now) Coalition (IL)
Indiana Afterschool Network
Iowa Afterschool Alliance
Kansas Enrichment Network
Kentucky Out-of-School Alliance
Louisiana Center for Afterschool Learning
Maine Afterschool Network
Maryland Out of School Time Network
Massachusetts Afterschool Partnership
Michigan After-School Partnership
Ignite Afterschool (MN)
Missouri AfterSchool Network
Mississippi Statewide Afterschool Network
Montana Afterschool Alliance
Beyond School Bells (NE)
Nevada Afterschool Network
New Hampshire Afterschool Network
New Jersey School- Age Care Coalition
NMOST (New Mexico Out of School Time) Network
New York State Network for Youth Success
North Carolina Center for Afterschool Programs
North Dakota Afterschool Network
Ohio Afterschool Network
Oklahoma Partnership for Expanded Learning Opportunities
OregonASK
Pennsylvania Statewide Afterschool/Youth Development Network
Rhode Island Afterschool Network
South Carolina Afterschool Alliance
South Dakota Afterschool Network
Tennessee Afterschool Network
Texas Partnership for Out of School Time
Utah Afterschool Network
Vermont Afterschool, Inc.
Virginia Partnership for Out-of-School Time
Washington Expanded Learning Opportunities Network
West Virginia Statewide Afterschool Network
Wisconsin Afterschool Network
Wyoming Afterschool Alliance