Art Sphere Inc.
Transforming Lives Through Art

Science through Art

for grades: Pre-K - 5th

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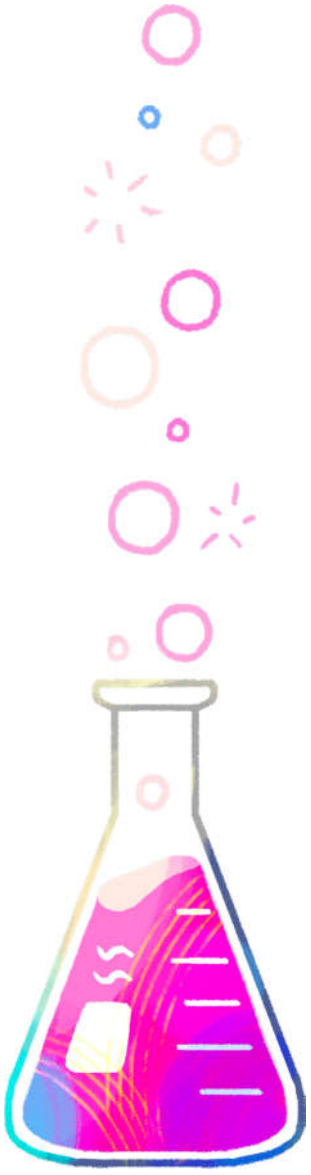


Art Sphere Inc.
Transforming Lives Through Art
STRENGTHENING OUR COMMUNITIES SINCE 1998

CREATING JOURNEYS THROUGH THE ARTS

Follow your creativity and go beyond where the path leads so you can leave a trail to inspire others to express themselves, too!

Preface

We are pleased to present the series *Creating Journeys Through the Arts* to take you on a path to transform everyday materials into art, to explore the intersections of art with nature, literacy, technology, theater, music, mindfulness and STEAM and to learn how to use the arts to express your core values. Throughout this journey, we invite you to reflect on the legacy that can be created through the arts.

How to Use Our Online Materials and This Book

Not everyone learns the same way. Some people are more visual, some more musical, some more mathematical[1]. Our lessons include symbols at the top of each page that indicate the different learning styles to be found in each project. By pointing out the different ways that a project can be approached, parents and teachers can guide their children to their individual paths to artistic success and ways to express their unique creative voices. The different learning styles and the symbols used to represent them in this book include:

1 These learning styles are based on Howard Gardner's discussion of types of intelligences. For more detail, see: Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences* (New York: Basic Books, 1983).

The lesson plans are more than just making art objects. They incorporate ideas such as compassion, mindfulness, respect for nature, healthy eating, cooperation, and other ideas for living in a way that contributes to a civil society. The pages are laid out as if you and the class are taking a journey:

- **Your Destination:** summarizes the outcome

- **Travel Kit:** list of materials you will need to make the object

- **On the Path:** ideas and directions for each child to make his/her own object, and ideas for exploring the meaning of each object

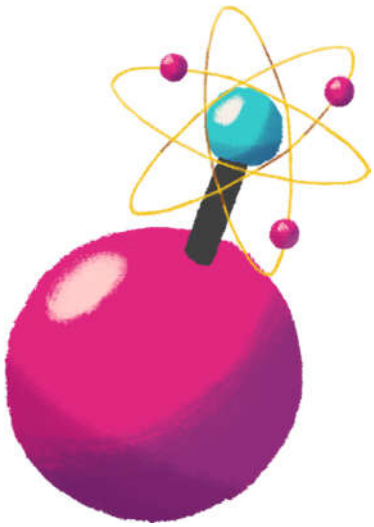
- **Group Tour:** how to transform the individual process into an interactive and collaborative group experience

- **Extend your Journey:** vocabulary, helpful references, and links to explore additional ideas

Find ways to express yourself - it's okay to think outside the box!

Knowing that links sometimes become inactive or are changed is beyond our control, and we apologize for the inconvenience. All the referenced links in this book have been checked for accuracy. Please check our blog: (https://artsphere.org/free-resources/curriculum/) and other social media channels for more suggestions on creative art projects.

The lessons in this book are written by instructor, **Jedidah Groseclose**. The designing and illustrations are by **Blair Nakamoto**.



Glossary

Absorbent When something is able to soak up liquid easily.

Absorber A thing or person that is able to take in something else.

Acceleration The rate of change in velocity of an object; speeding up.

Acid A substance that can give a hydrogen ion (H+) to another substance. Acids have a pH of less than 7.0.

Activator Something that can cause a reaction or change in another substance.

Additives Substances added to paint to improve it. They might add strength or durability.

Adhesion Tendency of particles or surfaces to cling to one another.

Adhesive A substance used for sticking objects or materials together, such as glue.

Adjacent Two things that are next to or touch each other or share the same wall or border.

Altostratus clouds Gray or blue-gray clouds that look flat and cover the entire sky. They are mid-level clouds.

Atmosphere The layers of gases that surround Earth.

Attraction When something draws something else towards it.

Base A base is an acid's "chemical opposite." A base is a substance that will accept the acid's hydrogen atom and can neutralize (counteract) it to form water and a salt.

Bind To hold or restrict by force.

Binder Something that allows the paint particles to stick together and makes the paint stick to the paper.

Bond The force which holds atoms together in molecules or crystals.

Buoyancy The ability of objects to float in water or air.

Capillary action When liquids, like water, move up through a solid, like a hollow tube or spongy materials.

Casein A whitish to yellowish protein that is found in milk and cheese. It is used in making paints, plastics, and adhesives.

Chromatogram The pattern or colors of the separated parts created by chromatography.

Chromatography A way of separating a mixture into different parts based on color.

Cirrostratus clouds Thin, sheetlike high clouds that often cover the entire sky.

Cirrus clouds The most common, wispy clouds. In high winds, they are blown into long streamers. Cirrus clouds are usually white and predict fair to pleasant weather.

Collaborate To accomplish something by working together with others.

Combine To mix multiple things together to make one thing.

Consistency The way in which a substance, typically a liquid, holds together; thickness or viscosity.

Control A sample that remains the same throughout the experiment.

Cumulonimbus clouds Thunderstorm clouds.

Cumulus clouds White, puffy clouds that look like pieces of floating cotton. Cumulus clouds are often called "fair-weather clouds."

Cushioning Something that absorbs some of the force of an impact.

Decomposition A reaction where a complex substance breaks down to form multiple separate substances.

Density The amount of mass per unit of volume. If an object is heavy and compact, it has a high density.

Direction The path that an object takes. For example, an object can be moved up, down, right, or left.

Glossary (continued)

Dispersion A mixture in which very small pieces of one substance are scattered within another substance.

Dissolve When a solute breaks up from a larger crystal of molecules into much smaller groups or individual molecules.

Energy The ability to do work.

Engineering The process of creating and building structures, products, and systems by using math and science.

Eruption When lava, rocks, and ash are sent upward in a sudden explosion.

Evaporate To turn from a liquid to a gas or vapor.

Float To rest on the surface of a liquid.

Force A push or a pull that makes things move. A force can also make objects go slow, go fast, stop or change direction. Force can be strong or weak.

Gas A form of matter in a state that has no fixed shape and takes up the volume of whatever container it is in.

Gravity Force of attraction that pulls all matter down.

Hypothesis An educated guess, or a guess you make based on information you already know.

Immobilization To make something unable to move.

Insoluble Difficult or impossible to dissolve.

Kinetic energy The energy an object has because of its motion.

Knead To mix by pressing, folding, and pulling.

Lava Hot, liquefied rock that flows from a volcano or other opening in the surface of Earth.

Liquid A form of matter that flows easily and is neither a solid or gas. Liquid can take on the shape of any container it is poured into.

Magma Molten, or hot, liquefied rock located deep below the Earth's surface.

Mass The amount of matter that makes up an object. It is measured in units called kilograms.

Model A small but exact copy of something.

Molecule A group of atoms joined together.

Motion When something is moving and changing position.

Newton's 1st law If an object is moving, it will continue to move unless something stops it, and if an object is still, it will stay still unless something moves it.

Newton's 2nd law An object will move in a direction depending on the way force has acted upon it.

Non-Newtonian fluid A fluid which changes its viscosity when the forces on it change.

Origin The point at which a small spot of a mixture is placed so that it can be separated by thin-layer chromatography.

Pigment The color chemical in paint.

Potential energy The stored energy an object has because of its position or state. A bicycle on top of a hill, a book held over your head, and a stretched spring all have potential energy.

Precipitation The release of water from the sky. It can be liquid or solid. Rain, sleet, hail and snow are all examples of precipitation.

Pressure The force over a given area.

Primary colors Red, yellow, or blue which can be mixed together to make other colors.

Products A substance that is formed as the result of a chemical reaction.

Projectile An object that continues moving using its own inertia once force has been applied. A projectile's movement after initial force is only affected by gravity.

Protein A nutrient found in food, like meat, milk, eggs, and beans that is made up of many amino acids joined together, and is a necessary part of the diet.

Glossary (continued)

Pull When you use force to move a thing closer to you.

Push When you use force to move a thing away from you.

Reactants Substances that are used to cause a chemical reaction.

Reaction A process that converts one or more substances to one or more different substances.

Reaction time The speed at which a chemical reaction happens.

Retention Absorbing or holding onto something.

Saturate The point at which a solution of a substance cannot dissolve any more of that substance.

Shock When a lot of force hits a small area. This can cause something to break.

Sink To move or cause to move downward.

Solid A state of matter where molecules are packed very closely together. Solids are firm and have a mostly stable shape.

Solubility The ability to dissolve something in a solvent.

Soluble Capable of being dissolved in liquid.

Strain To cause to pass through a strainer. This is similar to filtering.

Staining colors Colors that penetrate into the material being painted.

Structure Something built or arranged in a definite way.

Suspension A mixture between a liquid and particles of a solid.

Tectonic plates Pieces of land that connect together on the Earth's outer shell. They are like a giant, round puzzle that cover Earth.

Unity Being together or at one with someone or something. It is the opposite of being divided.

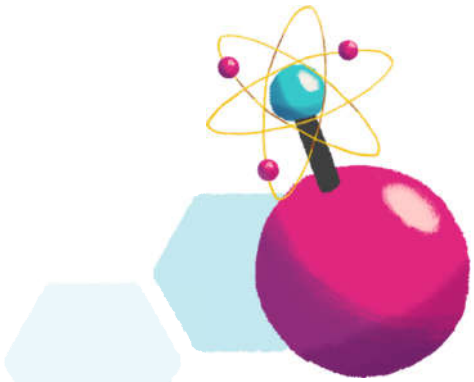
Vapor When liquid water is heated to boiling temperature, 100° Celsius (212° F), it all begins to turn into vapor or gas.

Variable A quantity or condition that can change.

Viscosity A measure of a fluid's resistance to flow.

Volume A measure of the size of an object, just like height and width are ways to describe size.

Work The transfer of energy when a force is applied on an object.



1. Rain Clouds in a Jar

Travel Kit:
food coloring, water, a clear jar, shaving cream, plastic pipettes, cup or bowl

Your Destination:

Make a rainstorm using household materials, and observe how water fills clouds and begins to fall from the sky. Clouds are a visible collection of water droplets in the air. They are formed by particles of water evaporating into the atmosphere and combining with other droplets. Eventually clouds will be formed as more water comes together. Once the cloud cannot hold any more water, it begins to rain, or precipitate, and the cloud will go away or shrink as water is released.

On the Path:

Step 1 Mix the food coloring and water in the cup and set it aside.

Step 2 Fill the jar ¾ of the way with water, and use shaving cream to fill the rest of the jar. The water in the jar will represent the atmosphere, and the shaving cream will represent the cloud.

Step 3 Using the pipettes, drop the colored water into the "cloud." The colored water should saturate the cloud and begin to come through the bottom and sink into regular water.

Step 4 Observe the amount of colored water that had to be dropped into the cloud before it starts "raining." Watch what happens to the shaving cream as more water is added, and how the colored water mixes with the regular water.

Group Tour:

Go outside with a friend or family member, and try to identify different kinds of clouds.

Extend the Journey:

Discuss the different types of clouds (cumulus, cumulonimbus, stratus, cirrus). What does each one mean? How do they look different from each other? Why?

- Cirrus clouds are the most common wispy clouds blown in high winds into long streamers. Cirrus clouds are usually white and predict fair to pleasant weather.
- Cirrostratus clouds are thin, sheet-like high clouds that often cover the entire sky.
- Altostratus clouds are flat, gray or blue-gray, mid-level clouds and cover the entire sky.
- Cumulus clouds are white, puffy clouds that look like pieces of floating cotton. Cumulus clouds are often called "fair-weather clouds."
- Cumulonimbus clouds are thunderstorm clouds.

Learn New Vocabulary: precipitation, vapor, atmosphere, cumulus, evaporation

Resources and Visual Aids:
https://thestemlaboratory.com/rain-cloud-jar/
https://easyscienceforkids.com/all-about-clouds/

Access Our Instructional Video: https://bit.ly/3yTafw5

2. Reactive Painting

Travel Kit:
liquid watercolor paint or food coloring, baking soda, water, spoon, vinegar, pipettes, watercolor paper or other thick paper, paint brushes, cups

Your Destnation:

Explore the reaction between two common household items: baking soda and vinegar. By painting with these, you are able to observe the reaction of two compounds, and you will practice mixing colors and using a new artistic medium.

On the Path:

Step 1 Combine water and food coloring or water colors to create your paint. Combine equal parts of this liquid with baking soda, and mix them together.

Step 2 Now you can paint! Make sure there is enough baking soda in the paint, and it is transferred to your paper. Test out different colors and experiment with mixing the paint to make the reaction more colorful at the end.

Step 3 Using a pipette, you can begin dropping small amounts of vinegar onto the paper where you painted. Observe what is happening. Use small amounts so that the paper will not become too soggy too quickly.

Group Tour:

Split into groups, and try different painting experiments. Have each group paint with only complementary colors, warm colors, cool colors, etc.

Extend Your Journey:

What happened when the vinegar touched the baking soda in the paint? Baking soda and vinegar react chemically because one is a base and the other is an acid. When vinegar and baking soda are mixed together, hydrogen ions in the vinegar react with the sodium and bicarbonate ions in the baking soda. This creates a new chemical: carbonic acid. This acid begins to decompose into water and carbon dioxide, which you can see and hear as the bubbling and fizzing reaction occurs.

Learn New Vocabulary: acid, base, reactants, products, decomposition reaction

Resources and Visual Aids:
http://www.learnplayimagine.com/2014/08/erupting-baking-soda-paint-recipe.html

Access Our Instructional Video: https://bit.ly/3ssO5Q1

3. Walking Rainbows

Travel Kit:
4 cups or glasses, paper towels, food coloring, water

Your Destination:

Experiment with mixing colors by making water "walk" through capillary action. Capillary action is the ability of a liquid to flow upward, against gravity, in narrow spaces. Adhesion allows the water molecules to cling to the cellulose fibers in the paper towel. Using the four colors, you can observe how the water climbs up the paper towels and mixes with the adjacent jar's color.

On the Path:

Step 1 Line the cups up in a row of four or in a circle.

Step 2 Fill the cups halfway up with water, and mix one color in each cup.

Step 3 Tear the paper towels into two-inch strips, and place one end in one color of water and the other in an adjacent color. Do this with each color jar until they are all connected to their adjacent jars.

Step 4 Make sure that the ends of the paper towels are all equally immersed in the water.

Step 5 The colored water will begin climbing up the paper towels on each end, meeting the color from the other end of the paper towel. Observe the colors that are being created as two colors mix from each cup.

Group Tour:

Show this experiment to someone else, and explain how capillary action works.

Extend the Journey:

Capillary action is an important part of how trees receive water and nutrients. Capillary action occurs when the forces of cohesion and surface tension are stronger than the forces of gravity. This allows plants to go against gravity and suck up water from their roots like a straw.

Learn New Vocabulary: capillary action, adhesion, primary colors, adjacent, gravity

Resources and Visual Aids:
https://thestemlaboratory.com/walking-water-rainbow/
https://study.com/academy/lesson/capillary-action-lesson-for-kids.html

Access Our Instructional Video: https://bit.ly/3eiTp0e

4. Salt Paintings

Travel Kit:

cardstock or paper, Elmer's glue, table salt, watercolors or food coloring, paint

Your Destination:

Explore a different medium of art using glue, salt, and colors. Through the adhesion of salt to the glue and the ability of water to dissolve salt, you can create colorful, 3-D salt paintings.

On the Path:

Step 1 Draw a design or picture on the paper using the liquid glue.

Step 2 Sprinkle salt onto the glue, making sure it is completely covered.

Step 3 Shake the excess off, and let the glue dry.

Step 4 Dip your paintbrush into the watercolors, and gently touch the salt design. You can also use a pipette to drop small amounts of colored water onto the paper.

Step 5 The paint will disperse on the salt design. Experiment with different colors, and watch the colors mix as they disperse on the salt.

Group Tour:

Try this experiment together, and then compare. Did using different colors or amounts of salt change how the painting looks? What do you notice?

Extend the Journey:

You can also try drawing your design first, and then tracing it with glue.

Learn New Vocabulary: absorbent, absorber, dispersion, adhesive, staining colors, discover

Resources and Visual Aids: https://artfulparent.com/raised-salt-painting/

Access Our Instructional Video: https://bit.ly/3egiau7

5. Marshmallow Construction

Travel Kit:

regular or mini-marshmallows, toothpicks, straws

Your Destination:

What kinds of things do architects think about when they design buildings? The focus of this activity is to learn how to envision a tower, make a plan, and then put it into action. You will practice teamwork and unity to have the best outcome and tallest tower.

Engineering projects allow you to explore different careers and hobbies you might have an interest in. Building and learning about construction gives you a chance to practice your critical thinking abilities as well as your analysis and planning skills.

On the Path:

Step 1 If you are working with other people, divide into teams, and share your materials evenly.

Step 2 Take five minutes to come up with a plan for how your team wants to build the highest tower, and elect a leader if needed.

Step 3 Put the plan into action! Take 20-30 minutes to build a stable tower. The group who has the tallest tower still standing at the end of the time wins.

Group Tour:

This is a group-focused activity. Delegate tasks to each member in a group to make sure everyone has a job to do, like leader or decorator. The purpose of this is to create a healthy, competitive spirit while encouraging teamwork.

Extend the Journey:

You can begin by creating 2-D shapes. After this, you can build on this by making them 3-D. This will help you begin your tower. You can also try to build a tower using only one shape, or you can create a structure such as a bridge or a boat. Think about how real-life structures are formed, and analyze different types of structures and what makes them work.

Learn New Vocabulary: unity, collaborate, engineering, model, structure, discover

Resources and Visual Aids: Marshmallow engineering: https://bit.ly/3mqbrSw, https://www.engineeringforkids.com/

Access Our Instructional Video: https://bit.ly/3HcoeAh

6. Magic Milk

Travel Kit:
full fat milk, food coloring, Dawn dish soap, cotton swabs, 2 shallow dishes or bowls

Your Destination:

Milk is composed of fats, protein, and minerals. Proteins and fats are easily affected by change, so when you add a substance, such as dish soap, a reaction occurs quickly. The molecules from the dish soap will rush around and try to attach to the fat molecules. Normally this reaction would be invisible, but because of the food coloring, you can see the particles bump into each other.

On the Path:

Step 1 Pour the milk into the bowl. Use enough to cover the bottom, and then add a little extra.

Step 2 Next, fill the surface with drops of the different colors of food dye.

Step 3 Pour a small amount of dish soap into the other dish.

Step 4 Touch a cotton swab to the dish soap, and gently touch the surface of the milk. Observe the reaction. What happens to the food dye?

Group Tour:

Split into pairs or small groups. Each person can have a chance to drop food dye into the milk, and take turns touching the surface with dish soap.

Extend the Journey:

You can place an outline, like a cookie cutter, on the surface and place the food dye inside. When the reaction occurs, it will conform to the shape as it spreads and leave the milk on the outside untouched. Draw what you see before adding the dish soap, what you think will occur, and what actually happens. Were you right? Also experiment with different types of milk, like 1%, half and half, and almond milk. Was the reaction the same?

Learn New Vocabulary: molecule, reaction time, protein, physical change, bond

Resources and Visual Aids:
https://littlebinsforlittlehands.com/magic-milk-a-classic-science-experiment-for-kids/
http://www.sciencefun.org/kidszone/experiments/milk-art/

Access Our Instructional Video: https://bit.ly/3phXsjD

7. Fireworks in a Jar

Travel Kit:
small bowl, jar, oil, water, food coloring, Alka Seltzer (optional)

Your Destination:

Food coloring dissolves in water, but not oil. However, oil is less dense than water and will stay on the top of the jar. The food coloring that the oil is holding will begin to sink into the water because it is heavier than the oil. This creates tiny "explosions" as the food coloring dissolves in the water.

On the Path:

Step 1 Fill the jar ¾ with water.

Step 2 In the bowl, mix 4 tablespoons of oil with several drops of each color of food coloring.

Step 3 Make sure the drops are mixed well enough and that they are separated into smaller drops throughout the oil.

Step 4 Gently pour the oil into the jar, and watch what happens.

Group Tour:

Do this project with someone else, and use different colors of food coloring. What do you think will happen if you mix them together? Will the colors mix, and why or why not?

Extend the Journey:

You can experiment with this project by using warm or cold water, and watch the differences. Does the food coloring dissolve differently? Also, try this out with Alka Seltzer tablets to make a homemade lava lamp!

Learn New Vocabulary: dissolve, suspension, buoyancy, insoluble, soluble

Resources and Visual Aids:
https://littlebinsforlittlehands.com/homemade-lava-lamp-density-science-experiment/

Access Our Instructional Video: https://bit.ly/32wLuKd

8. Skittle Rainbow

Travel Kit:

Skittles, ¼ cup of warm water, plate or shallow bowl

Your Destination:

Transform candy into a rainbow using the power of dissolving. Candy is full of dye, and the combination of sugar and dye is able to dissolve quickly. The warm water causes the dye to dissolve off of the candy and absorb into the water. Why do the colors stay separate? Each sugar coating that makes up the color of the Skittle is different depending on the color, so the dyes have different densities. This difference of density means that the colors will not mix.

On the Path:

Step 1 Arrange the Skittles in the row along the edge of the plate. You can arrange these in whatever pattern you want.

Step 2 Pour just enough water on the plate to cover the Skittles.

Step 3 Wait several minutes, and watch as the colors from the Skittles leave a trail as they move to the center, creating a rainbow.

Step 4 Try shaking up the colors, and see if they will mix. Eventually, the colors will separate again on their own.

Group Tour:

Try this experiment with a friend, and see if your candy creates different colors or designs.

Extend the Journey:

Try this experiment using different flavors of Skittles, or create designs like smiley faces before pouring the water in. What happens to the colors as they dissolve?

Learn New Vocabulary: absorb, density, dissolve

Resources and Visual Aids: Skittles experiment video: https://bit.ly/3qiogj2
More experiments: https://www.growingajeweledrose.com/search/label/Science

Access Our Instructional Video: https://bit.ly/3pk1ibV

9. Rainbow in a Jar

Travel Kit:
1 jar, 1/2 cup blue dishwashing liquid, 1/2 cup olive oil, 1/2 cup rubbing alcohol, 1/2 cup corn (or maple) syrup, food coloring, 5 spoons, 5 bowls for mixing

Your Destination:

Density is how compact and heavy something is. In this case, you will be exploring the density of liquids by creating a rainbow using household items. Corn syrup has the highest density, so it will stay on the bottom of the jar. After adding it, you will continue layering the liquids based on heaviest to lightest, with rubbing alcohol being on top. You should end up with a liquid rainbow with distinct lines because the densities of each liquid are so different. Do this activity with adult supervision.

On the Path:

Step 1 We are going to start with the purple layer. Mix the syrup with 1 drop of red and 1 drop of blue food coloring in a bowl. Pour this into the bottom of your jar.

Step 2 Pour the blue dish soap into the jar for the next layer.

Step 3 Mix the water with 2 drops of green food coloring, and pour this into the jar as the 3rd layer.

Step 4 Next, pour the oil into the jar for the yellow layer.

Step 5 Lastly, mix the rubbing alcohol with 2 drops of red food coloring, and pour this last layer into the jar. Now, you have a beautiful rainbow in your jar! Do the colors mix or blend? Why do you think the colors stay separated?

Group Tour:

If you do this project with someone else, you can mix one jar together, and keep a second jar for comparison. What happens to the jar you mixed?

Extend the Journey:

What would happen if you did this the opposite way, starting with the rubbing alcohol? Would it layer the same way? Would the colors mix in this case? Do you think the liquids would rearrange themselves in the right order?

Learn New Vocabulary: volume, density, mass, liquid, combine

Resources and Visual Aids:
https://www.123homeschool4me.com/rainbow-in-a-jar-density-experiments/

Access Our Instructional Video: https://www.youtube.com/watch?v=K_6YZETFxvM

10. Egg Drop Challenge

Travel Kit:
tape, bubble wrap, cardboard, straw, string, coffee filter, plastic bag, or any material that could work as a parachute, cotton balls, any recyclable material you have on hand can be used

Your Destination:

This activity gives you a chance to work with different materials and use teamwork. The challenge is to protect a raw egg from breaking as it is dropped from a certain height. Use only the materials listed to either build something to soften the impact of the fall, or slow the fall of the egg on its way down to the ground.

On the Path:

Step 1 If you are doing this project with other people, split up into teams.

Step 2 Think about your raw egg, and discuss what will happen if you drop it. What can you do to prevent this?

Step 3 Share materials evenly, and create something to protect your egg.

Step 4 Once all teams are finished, take turns dropping each egg from a set height using your construction. The team whose egg stays unbroken wins!

Step 5 Come back together to discuss what techniques or ideas you used. Did they work? What could you have done better?

Group Tour:

This activity is great for larger groups. Because everyone works in small groups, this facilitates teamwork and effort from each member. Everyone can also have a specific role based on what they enjoy, like planner, builder, or decorator. Bringing everyone back together as a whole also prompts them to share ideas and plans without negativity. Even though you are working in teams, the goal is for everyone to take part in this engineering activity.

Extend the Journey:

Discuss different designs and materials that would have made the experiment better. Could you do this with only straws? Plastic? Discuss the effect of immobilization, cushioning, and shock.

Learn New Vocabulary: immobilization, shock, cushioning, force, energy

Resources and Visual Aids:
https://sciencing.com/successful-egg-drop-ideas-8424463.html
http://www.beyondthechalkboard.org/activity/the-incredible-egg-egg-drop-challenge/
https://sciencing.com/do-balls-prevent-egg-breaking-5481018.html

Access Our Instructional Video: https://bit.ly/3qkR3n9

11. Marble Maze

Travel Kit:
paper plates, construction paper, cardboard, straws, tape, scissors, marbles

Your Destination:

For this challenge, you are creating a maze on a paper plate. You will be able to create obstacles, tunnels, ramps, etc. that you can navigate by moving your plate around to a final destination. This experiment teaches about Newton's 1st law of motion, the forces of "push and pull," and encourages dexterity, problem solving, engineering design, and creativity.

On the Path:

Step 1 What is a push and what is a pull? Can objects move on their own? Find examples of something you push or pull.

Step 2 Use a piece of blank paper to draw out a blueprint for the maze you want to create. Before beginning, go through each material available, and come up with ideas for how each can be used. Take 5 minutes to come up with a plan for your maze, and draw it.

Step 3 Make sure each person has a paper plate and an equal number of supplies to begin with, and start building!

Step 4 Create a start point where you want your marble to begin and a finish line, so you know where to end.

Step 5 Now, you can build the maze between the start and finish. Think about different things you can create, like ramps, tunnels, and barriers.

Step 6 Test it out! Can you guide your marble to the finish by only moving the plate side to side or around? Switch mazes with friends, and see if you can finish each other's.

Group Tour:

You can do this project in pairs or small groups. You could even use something larger, such as a piece of cardboard, to allow for larger groups to build together. To make this more challenging, work on your maze for 2 minutes, then rotate each plate to the right and work on the next person's maze. Continue doing this until your original plate gets back to you and see how it turned out. This allows for each person to have a part in everyone's project!

Extend the Journey:

What are the forces you use at the grocery store? Discuss different areas you see these forces at work. Pair up with someone else and push your hands together. Is either one moving?

You can also try sitting on the ground in pairs back-to-back with your arms linked. The goal is to stand by only using each other to push up off the floor. This requires a lot of teamwork and is a great hands-on example of the force of pushing.

Learn New Vocabulary: Newton's 1st law force, push, pull, direction

Resources and Visual Aids:
Isaac Newton and the laws of motion: https://www.coolkidfacts.com/laws-of-motion/
https://buggyandbuddy.com/paper-plate-marble-maze/
https://www.overdrive.com/media/453744/give-it-a-push-give-it-a-pull
https://www.generationgenius.com/videolessons/pushes-and-pulls/

Access Our Instructional Video: https://bit.ly/3FqKOEB

12. Popsicle Stick Catapult

Travel Kit:
popsicle sticks, rubber bands, plastic spoon, pom-pom ball, ruler, different weighing classroom items

Your Destination:

This activity will show energy and gravity at work. Catapults use stored energy to hurl a projectile for a distance. They were used in medieval times to cause damage to buildings and walls. The effectiveness of a catapult comes from the ability to transfer potential energy to kinetic energy and pass it to another object, like a pom-pom ball. The more you push down the catapult, the more energy is being stored, so when you release it, it goes even further. The ball will accelerate more or less depending on how hard you press and how heavy it is. Heavier items will go further than light ones because of the force involved.

On the Path:

Step 1 Begin by stacking 5 popsicle sticks on each other, and wrap a rubber band around each end.

Step 2 Place 2 more popsicle sticks together, and add a rubber band to only one end. Separate the 2 on the other end, and place the stack of 5 in between.

Step 3 You can rubber band the stack of 5 to the top stick to hold it together.

Step 4 Place the plastic spoon onto the top stick with the scooping side facing up. It should hang off the end of the stick slightly. This will act as your catapult.

Step 6 Experiment! Place the pom-pom ball on the spoon, and hold down the opposite side of your contraption. Push the spoon down and release!

Step 7 Measure the distance with the ruler. Is there a way to make it go further? Can you determine the direction it goes?

Step 8 Experiment adding popsicle sticks or moving parts of the catapult around to get the ball to go further.

Group Tour:

After everyone has completed their catapult, line up and compete to see who can get their pom-pom ball to go the farthest! Does anyone's go longer or shorter than most? Why do you think that is? Have each person catapult a different object and see which works the best.

Extend the Journey:

Practice Newton's 2nd law of motion. When an object is acted on by a force, how fast the object moves will depend on how heavy it is and how much force you have applied. Practice this by pairing up and pushing different weighing items.

Learn New Vocabulary: Newton's 2nd law, kinetic energy, potential energy, projectile, accelerate

Resources and Visual Aids:
Isaac Newton and the laws of motion: https://www.coolkidfacts.com/laws-of-motion/
https://www.real-world-physics-problems.com/catapult-physics.html
https://www.youtube.com/watch?v=IqV5L66EP2E&vl=en

Access Our Instructional Video: https://bit.ly/3st99WB

13. Salt Water Density

Travel Kit:
small plastic items that float, 4 clear plastic cups or jars filled ¾ of the way with water, salt, baking soda, sugar

Your Destination:

Adding solvents to water changes the water's density and causes objects in the water to do different things. Adding salt makes water denser and allows objects to float more easily. Baking soda is also a different kind of salt, but when it dissolves, it releases carbon dioxide gas. This creates tiny bubbles that rise to the surface, sometimes carrying objects with them. You will also observe what occurs when adding sugar. You will use regular water as a control group. This project teaches about controls and variables, as well as water density.

On the Path:

Step 1 Dissolve 2 tablespoons of salt in one cup, 2 tablespoons of sugar in the 2nd cup, and 2 tablespoons of baking soda in the 3rd cup. Make sure the 4th cup is only water, since it will be the control variable. Label each cup to stay organized.

Step 2 Think about the possibilities of what will happen when you drop plastic pieces into each cup.

Step 3 Experiment! Drop pieces into each cup, and observe what happens.

Step 4 You may need to add more salt, sugar, or baking soda, depending on what happens.

Group Tour:

Work in groups and discuss what you predict will happen. When you agree on a hypothesis for each jar, write it down. What are the variables, and what is the control factor? After observing, talk about what you think happened. How could you make something float if it did not?

Extend the Journey:

You can try this experiment with other materials such as cornstarch or seltzer water. Where do you see water density at work? How does this relate to floating in the ocean? What are liquids that are more dense or less dense than water?

Learn New Vocabulary: density, control, variable, dissolve, hypothesis

Resources and Visual Aids:
https://www.sciencekiddo.com/salt-water-experiment-ocean-science/
https://childhood101.com/density-experiment/

Access Our Instructional Video: https://bit.ly/30QGsYi

14. Color Chromatology

Travel Kit:
black marker, coffee filter, paper towel or tissue, glass or cup, water, pencil, tape

Your Destination:

The word chromatography comes from the Greek words for "color" and "writing." Chromatography is a simple technique that allows you to separate the components of a mixture. Using paper, ink is dissolved and pulled across the paper through capillary action. Black ink is a combination of several pigments, and some will travel further than others, which causes them to separate. This causes the mixture of colors in the ink to separate because each color of the mixture moves across at different rates.

On the Path:

Step 1 Cut or tear your paper into rectangular strips (about 1-2 inches wide).

Step 2 Draw a line with your pencil horizontally, about 1 centimeter from the bottom of the page.

Step 3 Draw a small dot in the middle of the line.

Step 4 Tape the top of the paper to the middle of the pencil, and place the pencil across the cup. The paper should hang down into the cup but not touch the bottom.

Step 5 Fill the cup with just enough water to touch the bottom of the paper. Make sure it does not reach the black dot, otherwise the color will just run off instead of traveling up.

Step 6 When the water nears the top of the paper, remove it and let it dry. You will see several colors that appeared as the water traveled up. This is your chromatogram!

Group Tour:

Discuss questions surrounding color. Is black still black after testing out this experiment? What do you think secondary colors are made out of?

Extend the Journey:

Try this experiment with different colors. What happens if you use primary colors? What about non-primary colors? Does a Sharpie marker have a different effect than a washable marker? Experiment and discuss different theories and hypotheses.

Learn New Vocabulary: chromatography, origin, chromatogram, retention

Resources and Visual Aids:
https://learning-center.homesciencetools.com/article/colorful-chromatography-science/

Access Our Instructional Video: https://bit.ly/3pqHaFq

15. Coffee Filter Flower

Travel Kit:
coffee filters, washable markers, baking sheet pan, scissors, water spray bottle, pipe cleaners

Your Destination:

Create a homemade bouquet of flowers using coffee filters and markers. The colors mix on the coffee filter because of solubility. The ink dissolves in the water that is sprayed onto the paper, and the colors are able to mix together. Water acts as the solvent, and the ink is the solute in this project.

On the Path:

Step 1 Flatten the coffee filter. Using the markers, draw designs or shapes to color in the coffee filter. The more colored in it is, the better results you will get.

Step 2 Place the coffee filter on the baking sheet. Using the spray water bottle, spray the filter paper with water. Watch as the colors start to blend together. Set it aside to dry.

Step 3 Pull the center of the coffee filter together, and pinch it together. Use tape to secure it.

Step 4 Using a pipe cleaner, twist it around the pinched center of the coffee filter, and leave the rest for the stem.

Step 5 You can repeat steps 1-4 to create a bouquet of colorful filter flowers.

Group Tour:

Ask other people to create their unique flower with you. At the end, combine them together to make a beautiful bouquet!

Extend the Journey:

Permanent markers will dissolve in alcohol, not water. You can try this project using permanent markers and rubbing alcohol and compare the differences. Use adult supervision. Do the colors blend the same way?

Learn New Vocabulary: solubility, attraction

Resources and Visual Aids: Handout for a different flower design to cut when dried:
https://artsphere.org/blog/coffee-flower-filter-handout/
https://bit.ly/3em6gPg
https://bit.ly/33WHtPR

Access Our Instructional Video: https://bit.ly/3Frm8Mi

16. Slime

Travel Kit:
glue, laundry detergent (liquid Tide), glitter (optional), spoon, container to store the slime, paper towels or tray to keep area clean

Your Destination:

This is a simple, two-ingredient slime recipe that is easy and contains safe products. Slime is a non-Newtonian fluid. This means that it is both a solid and a liquid at the same time! When glue molecules combine with an activator, like borax, saline, or detergent, they cross link and create a new substance called slime. In this reaction, glue cannot uncombine from the activator, so it permanently stays as slime.

On the Path:

Step 1 Pour some glue into your container. Start with half a cup if this is your first time.

Step 2 Add 1 tablespoon of detergent, and stir. Continue adding 1 tablespoon at a time and completely mixing before adding the next one. Your slime should begin to thicken and become less sticky. Keep adding detergent until it does not stick to your finger at all.

Step 3 Once it is not sticking to the sides of the container, you can pick it up and knead it with your hands. Make sure it is definitely not sticky before you do this to keep it from making a mess!

Step 4 The more you knead it, the better consistency it will be. Once you are satisfied, you can add glitter for decoration and knead that in as well!

Group Tour:

Experiment by making slime with other people. Whose slime is the thickest or thinnest, and why?

Extend the Journey:

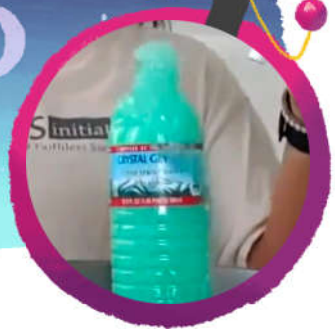
Viscosity is how scientists measure the friction in a liquid, and it determines how fast or slow a liquid will flow. Slime's viscosity is affected by temperature. The warmer it is, the easier it is to flow. Test this out by placing your slime in a cool place. Is it easy to knead? Now place it in the sun. What happened? Clear slime made from clear glue demonstrates this even better. It is rubberier than the white glue that is used in this activity and has a better reaction to temperature.

Learn New Vocabulary: non-Newtonian fluid, knead, consistency, viscosity, activator

Resources and Visual Aids:
https://babbledabbledo.com/all-the-slime-science-you-ever-wanted-to-know/
https://cdn.babbledabbledo.com/wp-content/uploads/2019/05/The-Science-of-Slime-PRINTABLE.pdf

Access Our Instructional Video: https://bit.ly/3Fro1bQ

17. Homemade Volcano



Travel Kit:
plastic bottle, baking soda, vinegar, dishwashing soap, food coloring, funnel (if needed)

Your Destination:

During this project, you will learn how a volcano works, learn about chemical reactions, and practice fine motor skills. You will be using baking soda and vinegar to cause the volcano to erupt. Baking soda is a base that reacts with vinegar, which is an acid. When these two substances combine, they create carbonic acid and water, which dissolves into carbon dioxide. Carbon dioxide is what causes an eruption of bubbles and fizzing. You will also be able to experiment with the food coloring and observe how it mixes throughout the reaction.

On the Path:

Step 1 Set up your bottle. You may want to place it in a box or on a tray to keep the area clean. You may also have to secure the bottle using playdough or tape.

Step 2 Pour 3 to 4 spoonfuls of baking soda into the bottle using the funnel. You can add a couple more spoonfuls if you want a bigger or longer reaction.

Step 3 Add a couple drops of dish detergent and a few drops of food coloring if desired.

Step 4 Using the funnel, quickly pour in the vinegar. It will react instantly with the baking soda, so make sure you remove the funnel and your hands right after you do this. You can pour the vinegar until the reaction nears the top rather than measure a specific amount.

Step 5 Watch what happens. How long did the reaction continue? You can record or draw what you saw happen.

Group Tour:

You can do this project as one group. You can draw a volcano as you learn about what occurs in a volcanic eruption. Then, decide who will do each job when creating the volcano. You can take turns holding the bottle, pouring the ingredients, or holding the funnel. After the reaction, draw what you saw happen. Then, you can compare your drawings.

Extend the Journey:

How is a volcano created? The earth is made of tectonic plates that shift. Volcanoes occur where these plates connect and push up Earth's crust. Magma is formed as these plates shift and create friction, and when the magma finds a way to the top of the volcano, an eruption occurs.

Learn New Vocabulary: eruption, magma, lava, pressure, tectonic plates

Resources and Visual Aids: https://bit.ly/3ErJ1h8

Access Our Instructional Video: https://bit.ly/3eBWo4d

18. Oil and Watercolors

Travel Kit:
watercolor or food coloring, water, eye droppers or straw, cooking oil, paper (preferably watercolor paper), tray, containers for paint and oil

Your Destination:

With this project, you will combine two liquids that do not mix and watch them dry together to create a cool design on the paper. Oil is insoluble in water and less dense than water, so water will always sink below the oil, which will create the design.

On the Path:

Step 1 If you are using food coloring, mix a couple drops with water for each color, and pour about a ¼ cup of oil in another container.

Step 2 Place your paper on the tray, and clear your area.

Step 3 Using the straw or eyedropper, drop different colors of watercolor onto your paper.

Step 4 Next, use the dropper to drop oil onto the paper where the watercolors are. Continue doing this a few times to watch the colors mix.

Step 5 Move the paper to a safe area to allow it to dry.

Group Tour:

Do this project with someone else and share the designs you created!

Extend the Journey:

You can dip the paper in water before beginning the project. This will allow the watercolors to spread more throughout the paper. Compare the differences between the paper that was dipped and the original one.

Learn New Vocabulary: density, float, insoluble, sink, saturate

Resources and Visual Aids:
https://www.wonderopolis.org/wonder/why-dont-oil-and-water-mix
https://www.youtube.com/watch?v=h5yIJXdItgo

Access Our Instructional Video: https://bit.ly/30Wr3G7

19. Homemade Puffy Paint

Travel Kit:
equal parts salt and flour (start with ¼ cup of each to test it out first), half the amount of water in comparison to salt and flour (if you are using ¼ cup of salt and flour, then use 2 tablespoons of water), squirt bottles or a resealable plastic bag, food dye, bowl, spoon

Your Destination:

Create your own paint using 3 ingredients. It is always fun to try out new methods of painting, and this paint is a puffier homemade version than normal paint. Paint is made from three essential components: pigments, binders, and solvents. You can recreate each of these, and learn about the basic science behind paint.

On the Path:

Step 1 Mix all the ingredients in the bowl. You may have to experiment with the amounts to keep the mixture from being too watery or too thick. Add your food coloring and mix.

Step 2 Scrape the mixture into your bottle or plastic bag. If you are using a plastic bag, then cut a small hole in the corner tip.

Step 3 Draw your design using the bottle or plastic bag. You can use as many colors as you want. The paint will come out raised off the paper.

Step 4 Leave this out to dry. The paint will remain puffed up even after it is dry.

Group Tour:

If you make puffy paint with other people, you can share the colors you create. When you are done, show each other your paintings.

Extend the Journey:

What is paint? Think about what paint is used for and what you would want to add to your paint to get a certain result. You could think about additives like sand, glitter, or a glow in the dark substance to make you paint look cool, but an additive could also be shaving cream to make your paint fluffier. There are many different ideas that will allow your paint to be uniquely yours.

Learn New Vocabulary: pigment, binder, solvent, additives

Resources and Visual Aids:
https://bit.ly/3prfAYg
https://kids.kiddle.co/Painting

Access Our Instructional Video: https://bit.ly/3yVdnrm

20. Milk and Vinegar

Travel Kit:
1 cup of milk, 4 tablespoons of vinegar, cookie cutters, strainer, paper towels, Sharpies, microwavable bowls

Your Destination:

Use two ingredients to make your own plastic. Milk and vinegar are able to create a substance called casein plastic, an alternative version of real plastic. Milk has a protein called casein, and when it comes in contact with vinegar the molecules refuse to mix. Instead, they rearrange and form strong bonds. This allows you to make shapes and explains why it will dry and harden in the shape it is in.

On the Path:

Step 1 Pour the milk into the microwave-safe bowl, and place in the microwave for 90 seconds.

Step 2 Mix in the vinegar, and stir for about a minute.

Step 3 Pour the liquid into a strainer to remove all the milk. Let the milk drain into another bowl.

Step 4 Press the paper towels into the strainer to get all the excess milk out.

Step 5 Place a paper towel on a flat surface with the cookie cutter on top. Next, press your substance into the cookie cutter, ensuring that there are no empty spots.

Step 6 Let this sit out to dry for 1-2 days in the cookie cutter to maintain the shape.

Step 7 Now, you can take it out of the cookie cutter. You should now have your very own shaped plastic! You can now decorate it with your Sharpies or leave it as it is.

Group Tour:

Try this project with other people. When your plastic is dry, you can decorate it together.

Extend the Journey:

Try using different types of milk. Would fat free or 2% work better? What about almond milk? You can also experiment with another type of acid, like lemon juice. Would this acid create a different reaction than vinegar?

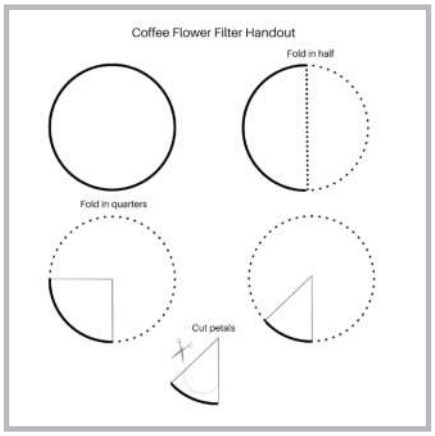
Learn New Vocabulary: casein, strain, bind, protein, insoluble

Resources and Visual Aids: https://bit.ly/3yUkrEL

Access Our Instructional Video: https://bit.ly/3JditEb

APPENDIX

15 Coffee Filter Flower



https://artsphere.org/blog/coffee-flower-filter-handout/

Learn more:

https://artsphere.org/interactive-programs/classes/steam/

Resources:

Dictionary.com

Wikipedia.com

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Transforming Lives Through Art

Art Sphere Inc. (ASI), founded in 1998, provides meaningful free arts programs for underserved populations in an effort to engage the creativity in communities, empower neighborhoods, explore the positives in peoples' lives, and heal the mind, body, and spirit through the arts.

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