Scribble & Smear

Art Club

THE EDGERTON EXPLORIT CENTER
www.edgerton.org

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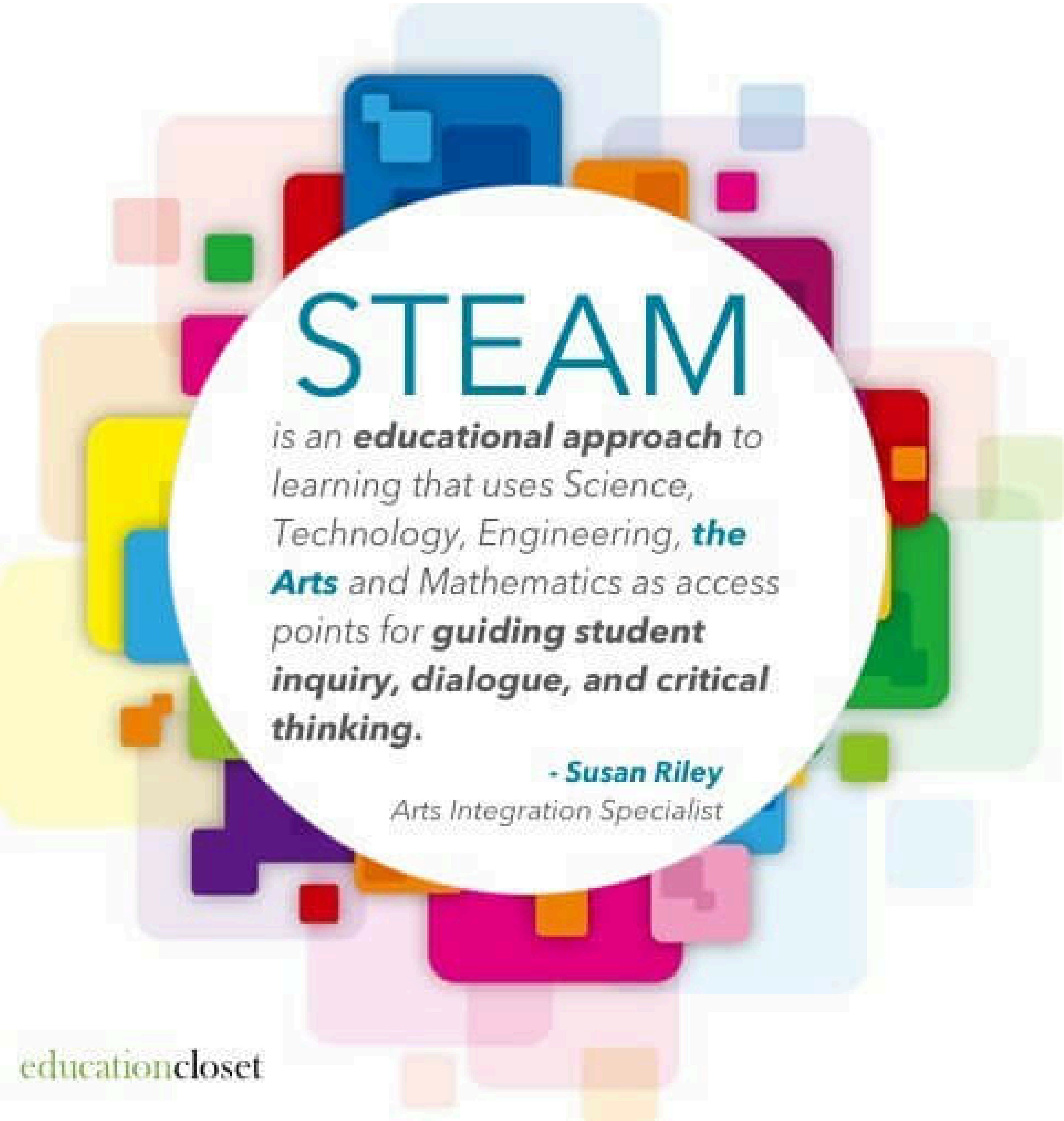

STEAM
is an educational approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialogue, and critical thinking.
- Susan Riley
Arts Integration Specialist
educationcloset

Why is Art Important To Science?

Why is Art Important to Science?

Art and science may seem like polar opposites. One involves the creative flow of ideas, and the other cold, hard data. Oftentimes when we think of science, we think of abstract notation, formulae that are hard to read or grasp. Another concept that may come to mind is the rigidity of science, the rule-based idea of solving the problem correctly or not, giving the proper response. Although part of it may be true to a certain extent, to depict reality the responses must be precise and exact, another portion is lacking because of its superficial character. "The finest scientists are artists," quoted by Albert Einstein.

The reason why art is necessary to science is that creativity involves imagination and imagination is visualization. Oftentimes, the ability to visualize and imagine certain processes is important to solving scientific problems. The goal of art in the field of science is to understand the world and create unique masterpieces within the world. 'One cannot create without creativity'. Things in our minds that we can comprehend, envision or envisage are things we can make if we have the instruments to do so. Often, some of the largest science breakthroughs incorporate some kind of art. For instance, Charles Messier, an 18th-century French astronomer, had a database of over 110 drawings from his diaries. Halley observed many galaxies, clusters, and nebulae in his study of the night sky in quest of a wandering comet. Leonardo DaVinci, who frequently uses art to shape his imagination and abstract concept to reality, is one example that we all know about. Many of his sketches and scientific artistic concepts have been proven to have led to actual innovations.

The use of art to study science not only enables individuals to grasp the essence of science but also enables them to grasp better scientific ideas and norms. It would be good to establish an environment in which science is being taught through visualization, art, and creativity in a period when our society is advancing using various technological instruments. Art is a strong instrument to communicate a science tale. Art may help us experience these difficult portions of the natural world and give light to new scientific findings via many scientists dealing with the oddest of the animal world — such things as animals with a handful of eyes and bodies so different from ours

Art's Role in S.T.E.M.

Art's Role in S.T.E.M.

Art plays a crucial role in STEM (Science, Technology, Engineering, and Mathematics) because it encourages creativity, critical thinking, and innovation, which are essential in these fields. Here are a few reasons why art is important in STEM:

1. Creativity and Innovation: Art fosters creativity, allowing people to think outside the box. In STEM fields, innovation often comes from thinking in new ways, and art helps develop this ability.

2. Communication: Art enhances the ability to visualize and communicate complex ideas. Engineers, scientists, and technologists often use diagrams, models, and other visual tools to explain concepts or data.

3. Design and Functionality: Good design is essential in engineering and technology. Art teaches principles of design, such as balance, symmetry, and proportion, which are crucial in creating functional and aesthetically pleasing products.

4. Problem-Solving: Art involves a lot of problem-solving and experimentation, skills that are directly transferable to STEM fields. Artists often face challenges in their work, and finding solutions enhances their ability to tackle problems in STEM.

5. Human Connection: STEM fields are not just about numbers and formulas; they also impact people's lives. Art helps bridge the gap between technical work and human experiences, making technology more user-friendly and accessible.

By integrating art with STEM, we create STEAM (Science, Technology, Engineering, Arts, Mathematics), which leads to a more holistic approach to education and problem-solving.

INTRODUCING EVERYONE

getting to know our class

HANDS UP FOR SCIENCE

An activity designed to get to know one another

Levels: K through 5th
Time: 20 to 25 minutes

OBJECTIVES

To help us learn more about the friends around you, we are creating a mural together that says,
“Hands Up for Science!” “Reach for the STARS!”
Each Student will be creating a one-of-a-kind hand that is designed by you and shows a little bit about who you are!

PREPARATION

It’s best to do this activity at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

ACTIVITY

1. Outline the hand and part of the arm with a pencil first (outline non-dominant hand) and then trace over the pencil with a Sharpie marker. Demonstrate how to do this.

2. Cut out the hand outline.

3. Use markers to decorate a one-of-a-kind hand.

4. The child needs to include their first name on the front of their hand.

5. Kids may design the hand how they want, include things about themselves, or simply decorate it.

6. When completed, kids may glue their hands to the mural. Add on stars.

7. Display in a prominent place in your classroom.

MATERIALS:

EACH STUDENT NEEDS:

- Mural Paper/Roll Paper with the words “Hands Up For Science” “Reach for the Stars” on it.
- Paper for kids to trace their hands and forearms on Or print use a preprinted handprint template (included below).
- Washable Markers
- Scissors
- Painter’s Tape to affix mural to the wall
- Glue sticks or Rubber Cement to attach hands to mural
- Star cut outs - write areas of science study on each star

REFLECTION

Things to do after the activity

Display mural in a prominent place for kids to enjoy.

Show a finished hand outline that you have designed and cut out. Talk about what things you like that you included on your hand, favorite colors you used, etc. Then brainstorm things the students could include on the hand outline....circles, stars, hearts, swirls, diamonds. Favorite sport, activity, food, season, etc.

WOULD YOU RATHER

A team-building activity designed to get to know each other

Levels: K through 5th
Time: 5 to 10 minutes

OBJECTIVES

Start a dialogue with the reminder that we are all different and that is what makes life and friends so fun and interesting! Today we are going to discover some fun things about our class—
We will discover we all have different interests and talents.
We will discover that we may like different things — and that is GREAT! It would be a boring world if everyone was the same and thought the same and liked the same things!!

MATERIALS:

EACH STUDENT NEEDS:

- Nothing! You don't need anything in order to play!

PREPARATION

Watch this video on why scientists need to be a good teammate:
The Power of Teamwork

Before you play, create a list of fun (and appropriate) would you rather questions. The more you come up with, the more you'll get to know your group!

REFLECTION:

1. How does getting to know your group/team/class make you a better scientist?
2. Share something you learned about another group member!

ACTIVITY

Have kids stand in a single file line facing the "question asker" who is standing at the front of the room.
When each question is asked, kids will step either right or left out of line to indicate their preference. Have them look around to see their peer's responses. All volunteers and helpers can be in the line as well indicating their preferences! preference for each question---have kids either step right or left out of the line. All volunteers and helpers need to be in the line too showing their preferences.

WOULD YOU RATHER QUESTIONS

- Would you rather ride an elephant or a camel?
- Would you rather be able to fly or breathe underwater?
- Would you rather swim with dolphins or swim with turtles?
- Would you rather be an amazing dancer or an amazing singer?
- Would you rather eat at McDonald's or eat at SpongeBob's restaurant?
- Would you rather be invisible or be able to fly?
- Would you rather own a horse or a bear?
- Would you rather be able to drive a car or fly a plane?

STRING WEB ACTIVITY

A get-to-know-you activity designed to show how we are all connected!

Levels: K through 5th
Time: 10 to 15 minutes

OBJECTIVES

This activity helps students think about their existing networks and the connections that are all around them. Was there ever a point in the activity when it seemed like someone wouldn't find something in common? Probably not! You can always find ways to connect with others, even over trivial things.

PREPARATION

Watch this video on how this activity is played:
String Web Activity

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

ACTIVITY

1. Gather the students in an open space in your room andhave them sit in a circle.
2. Start with the ball of yarn in your hands and 1. Say your name and 2. Share something about yourself.
3. Hold the end of the yarn in one hand and with the other hand toss the ball of yarn to a student.
4. That student catches the ball of yarn and answers the same two questions before holding on to the yarn and tossing it to another friend.
5. Continue on until everyone has had a turn.
6. If time allows, go through another round asking "favorite sport," "favorite snack," favorite animal," etc.

MATERIALS:

YOU WILL NEED

- Ball of Yarn

REFLECTION

Questions to ask after the activity

Was there ever a point in the activity when it seemed like someone wouldn't find something in common?

How many times were you holding onto the string? The more strings you're holding, the more times you spoke up and made an effort to make a connection, and the more connections you've made, the stronger your network.

What happens if you let go of one of your strings? An important part of building a network is maintaining it.

Look around at the web you've created. You're all connected to each other, maybe in ways you did not expect. Even if your string isn't directly connected to someone, you're connected to someone else who is connected to that person; that's how networks function - you use your network to make the connections that you can't make directly on your own.

ADDING ART TO S.T.E.M

Learning Science Through Art

LINE ART W/ HOMEMADE DICE

Levels: K through 5th
Time: 30 to 40 minutes

OBJECTIVES

The objective of this game is for children to create a fun and artistic "Wacky Hair Day" portrait by rolling a dice they've crafted themselves. Each roll of the dice determines the type of line they'll add to their drawing, resulting in a unique and creative masterpiece.

By playing this game, children can enhance their fine motor skills through cutting, folding, and gluing their dice together. The activity also fosters creativity and imagination as they experiment with different lines and colors to design their portraits. Additionally, following instructions and working with different materials helps improve their focus, patience, and ability to follow a sequence of steps.

MATERIALS:

EACH STUDENT NEEDS:

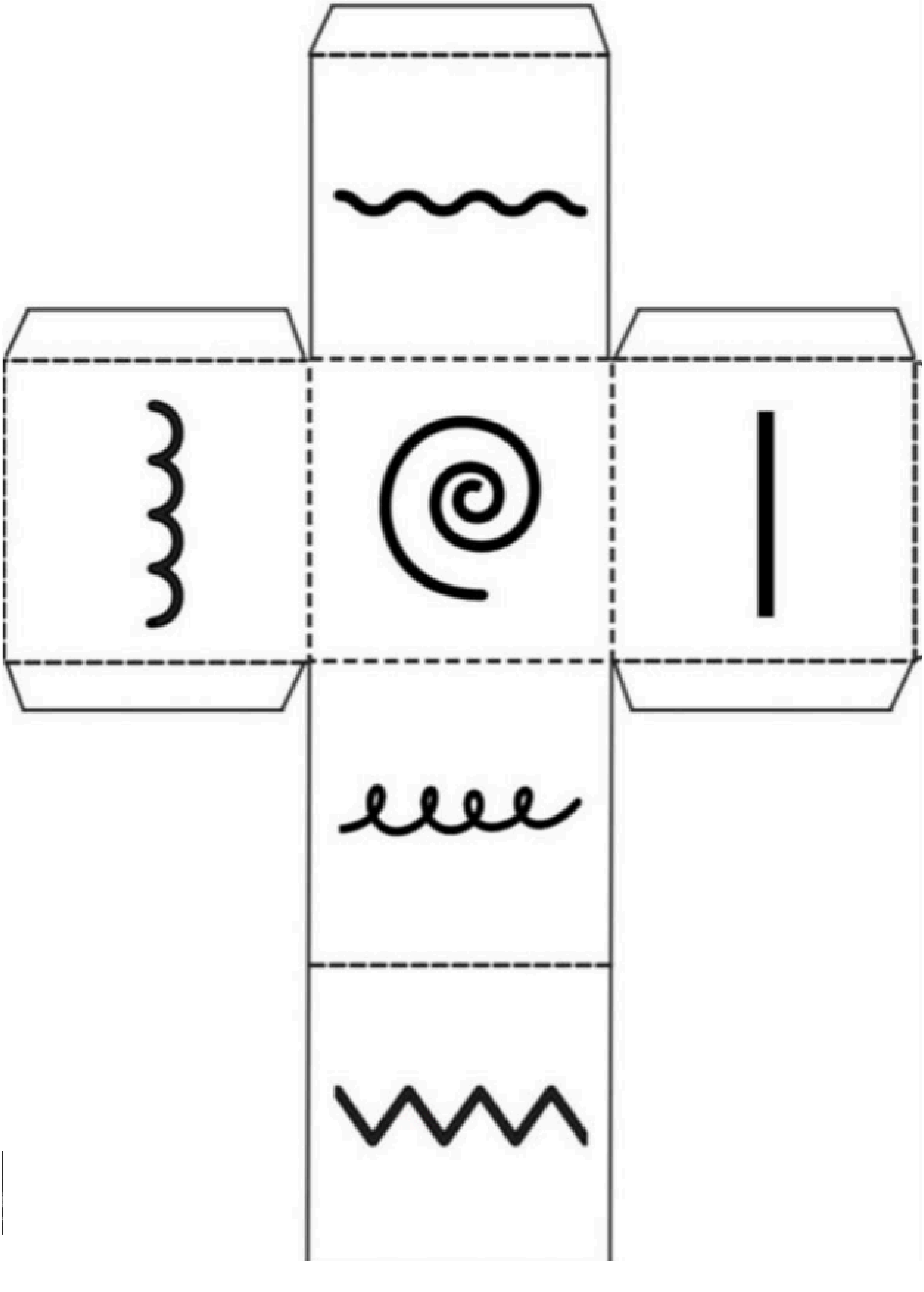
- Dice pattern for each student (templates below)
- Preprinted faces (templates below)
- Markers
- Scissors
- tape/glue sticks

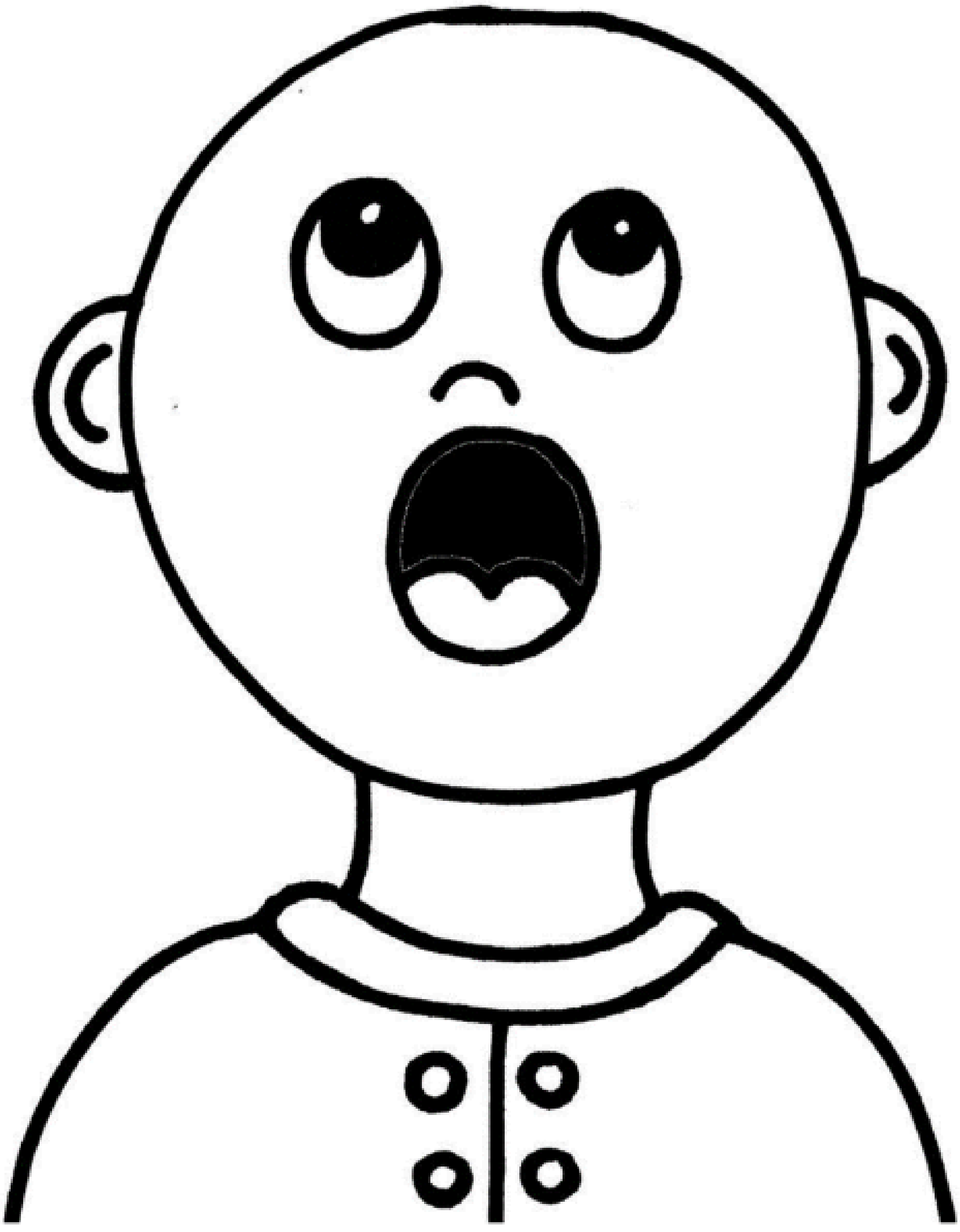
PREPARATION

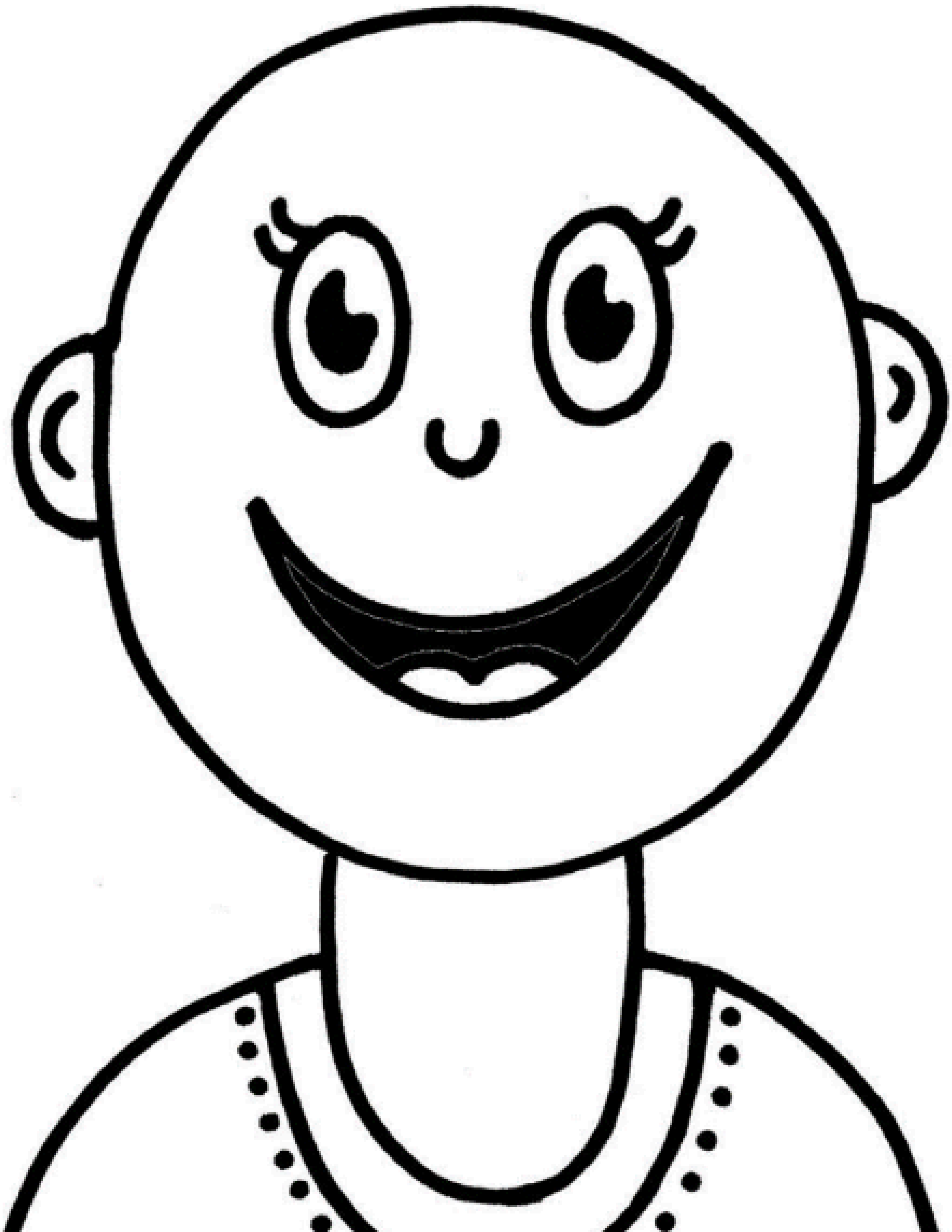
It's best to do this activity at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

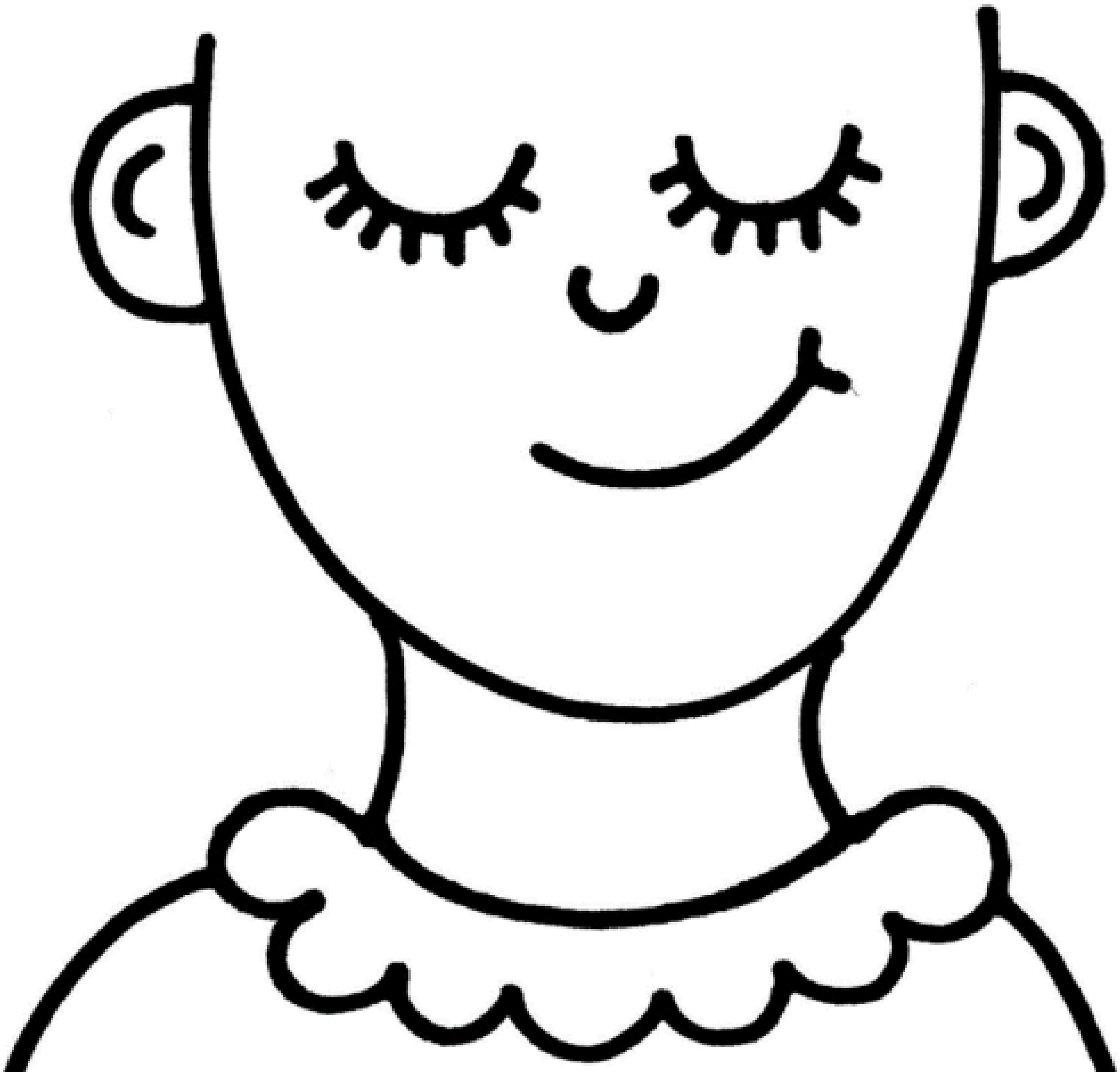
ACTIVITY

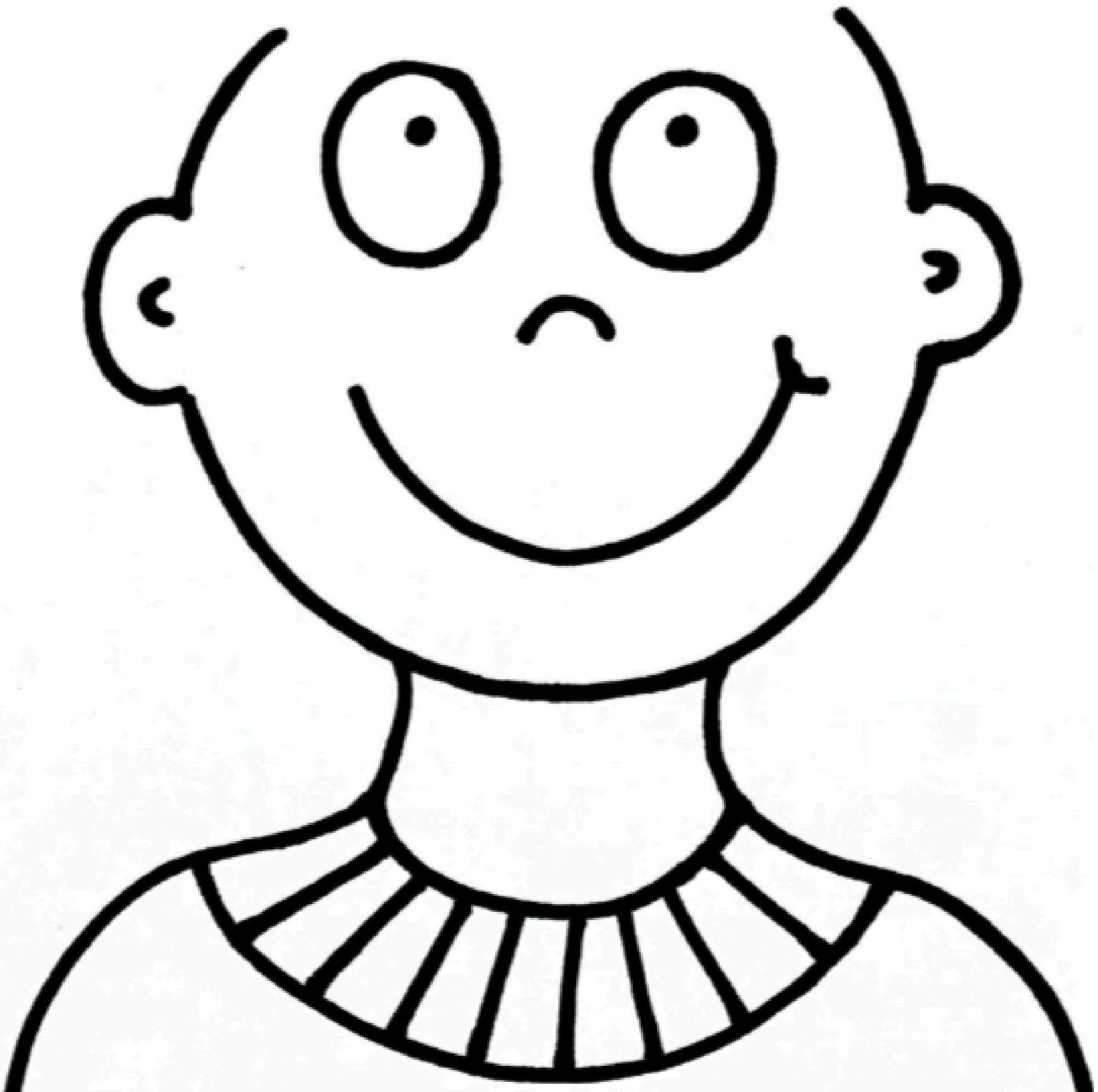
1. Photocopy dice patterns and face patterns and have on hand.
2. Kids will fold and glue/tape their dice together. Demonstrate this process. Young children will need assistance with accurate cutting and folding.
3. Demonstrate how each side of the dice represents a different type of line. When they roll a specific line, they may add that line to their "face page" to create a Wacky hair day artistic masterpiece.
4. Encourage kids to use different colors for each line and to make their portrait interesting and fun!
5. Kids may display and share their final products upon completion.

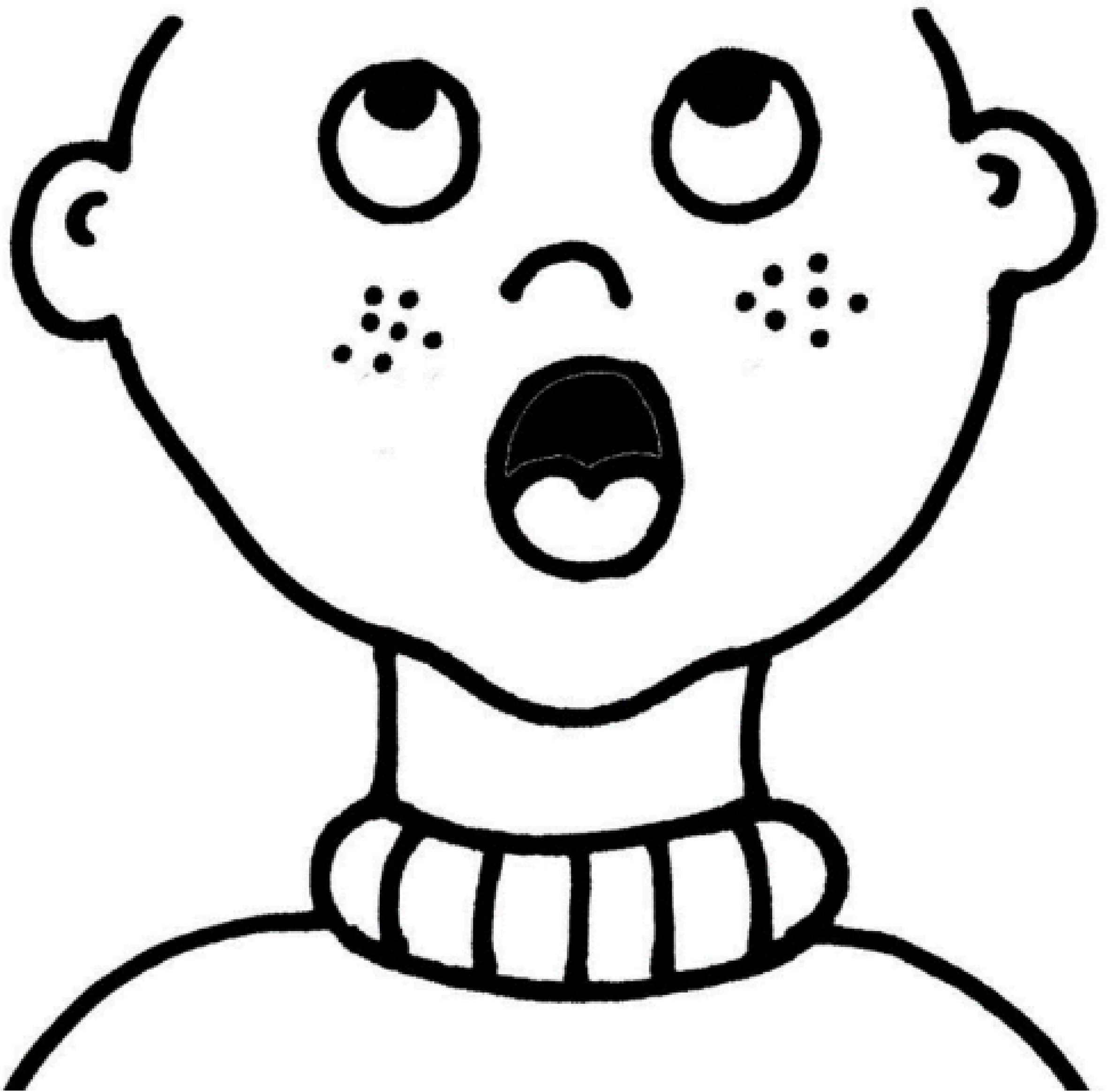












MODEL MAGIC CREATE-URES

Levels: K through 5th
Time: 35 to 45 minutes

OBJECTIVES

Scientists often face complex problems that don't have straightforward solutions. Imagination allows them to think creatively, explore new possibilities, and come up with innovative ways to solve these problems. For example, imagining how a new material might behave under certain conditions can lead to groundbreaking experiments
This open-ended activity will allow kids to create a brand new "create-ure" that currently doesn't exist using a variety of craft supplies and their unlimited imagination.

MATERIALS:

EACH STUDENT NEEDS:

- Crayola Model Magic

OPTIONAL MATERIALS:

- Construction paper
- Craft sticks
- Pipe cleaners
- Sequins
- Yarn
- Pom poms
- Googly eyes
- Feathers
- Toothpicks
- Scissors
- Foil
- Cotton
- Glue
- Masking tape
- Hot glue guns
- Uncooked noodles, rice, and/or beans

PREPARATION

Watch this video on the science of imagination:
The Science of Imagination

Watch this video on how this activity is made:
Model Magic Creatures

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

ACTIVITY

As the kids create, they will need to:

a. Decide on a name for their create-ure
b. Decide what type of food it eats.
c. Decide how it would protect itself from predators.

Give them materials and let their creativity and imagination run free! Let everyone give a presentation of their creature and all about their creation!

After the students present, ask them how their creativity and imagination can help them to become great scientists! What parts of "thinking outside the box/norm" can help them figure out the questions scientists are working on.

ORBEEZ STRESSBALLS

An activity designed to teach a healthy way to relieve stress

Levels: K through 5th
Time: 15 to 20 minutes

OBJECTIVES

Begin by talking about what stress is and what a person can do to get rid of stress. Have kids share what they do when they feel stressed. Then touch base on the following suggestions: Exercise/moving around, deep breathing, think of something happy and relaxing, do something fun/something they enjoy, listen to music, journal, eat a healthy snack, and talk to someone who you trust to help you work through the stress. Tell the kids that they will have the chance to create two items to take home today that they can use for fun and to help if they are feeling stressed. They will be making STRESS BALLS.

PREPARATION

Watch this video on how to properly use a stress ball:
How to Use A Stress Ball

Watch this video on how this activity is made:
Orbeez Stress Balls

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

ACTIVITY

Step 1: Add Orbeez to the balloon

a. Blow up the balloon, then let it deflate to stretch out the latex/rubber.
b. Place the neck of a funnel into the balloon's opening, making sure it's tight or completely inserted.
c. Pour water beads into 1/2 teaspoon measuring spoon.
d. Then pour the premeasured Orbeez into the funnel.
e. Gently shake to ensure all Orbeez are inside the balloon.
f. Remove the funnel from the balloon.

MATERIALS:

EACH STUDENT NEEDS:

- 1 clear balloon (12 INCH)
- 1/2 teaspoon water beads (ORBEEZ OR OTHER BRAND)
- 1/2 cup Water

TIPS

Latex allergies are very common nowadays. Be sure to gather the allergies of your students from them (or their parents) to ensure you're not going to give anyone latex that can't use it!

There are latex-free balloons on amazon if you have any allergies

REFLECTION

How do you think squeezing or playing with your stress toy might help you feel calmer or less stressed?

What else do you do when you are stressed? Is it helpful or unhelpful?

What other toys could you make to help you relieve stress?

Step 2: Add water to the balloon

a. Carefully stretch the neck of the balloon around a kitchen or bathroom faucet.
b. Place a 1/2 cup measuring cup under the balloon. Turn on the tap slowly to create a light stream of water into the balloon.
c. Turn the tap off when the balloon fills the measuring cup.
d. Remove the balloon from the tap and tie a knot in the balloon, as close to the water line as possible.

Step 3: Let the Orbeez grow!·

a. Set the balloon on its side and wait 3 - 4 hours for the Orbeez to fully expand inside the balloon.
b. Be sure to check in while the Orbeez are growing to see the "magic" happen! It's fun to watch the half grown Orbeez floating around inside.
c. Use scissors to trim the excess balloon neck, cutting just above the knot.

WHAT TYPE OF BALLOON WORKS BEST?

A clear balloon (12 inch size) will work best because you'll be able to see the colours and outlines of the water beads inside the balloon.

HOW LONG DO THEY LAST

These stress balls should last about 2 weeks – but that's not a guarantee. They're really fun to squeeze and they get squeezed a lot harder than other stress balls (just because it's so fun to see the water beads in the stretched balloons!), so they may not last that long.

We made two Orbeez stress balls and one of them lasted a month, and the other one only lasted 24 hours. We squeezed our first one like crazy and by the next day it had a tiny pin sized hole in it. I could hear water bubbling out of the tiny hole when I squeezed it and my hands were getting a little wet, so I threw it away.

Balloons become fragile over time and you really don't want to clean up a water bead mess if it pops in a drawer somewhere. So make sure you keep track of your Orbeez stress ball and don't forget about it!

RAISED SALT PAINTING

A S.T.E.A.M. activity designed to bring art into science!

Levels: K through 5th
Time: 35 to 40 minutes

OBJECTIVES

Art and science are deeply connected, as both involve creativity, exploration, and the pursuit of understanding the world around us. In science, creativity is essential for forming hypotheses, designing experiments, and visualizing complex concepts. Similarly, art often relies on scientific principles, such as light, color, and perspective, to create accurate and meaningful representations. Both fields encourage curiosity and innovation, leading to new discoveries and expressions. Together, art and science inspire each other, pushing the boundaries of human knowledge and imagination.

PREPARATION

Watch these videos of an explanation of the science behind this activity:
Primary Color Song

Watch this video on how this activity is made:
Raised Salt Paintings

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

MATERIALS:

EACH STUDENT NEEDS:

- Card stock
- Squeeze bottle of glue (such as Elmers)
- Table salt
- Diluted food coloring
- Paint brushes or Droppers
- Pencils
- Cookie sheets or trays to catch excess salt (excess may be reused on projects)

STEAM CONCEPTS LEARNED

Science: Salt is a hygroscopic ionic compound that is strongly attracted to and absorbs polar water. Being hygroscopic means salt can absorb water from liquid or vapor in humid air. The salt quickly attracts and absorbs the water before it can touch the paper, allowing the water to color only the salt lines (as long as they drop the water close to the salt lines).
Engineering: This is a great way to work on developing fine motor skills with young kids. Tracing with glue and sprinkling the salt are not easy to do for young kids. They will develop the skills and attention to detail that is necessary in future STEM careers, such as engineering.
Art: Let your kids test their drawing skills. Practice shapes, lines, or more complicated items. They are also learning about colors.

VOCABULARY

words to know for this experiment

Primary Colors: basic colors that can be mixed to produce other colors. They are red, yellow, and blue

Secondary Colors: color combinations created by the equal mixture of two primary colors. According to the traditional color wheel, red and yellow make orange, red and blue make purple, and blue and yellow make green.

Hygroscopic: something absorbs or attracts moisture from the air

ACTIVITY

Before kids arrive - use individual cups to mix up the diluted food coloring. About 15-25 drops per 4 oz of water works well.
Use newspaper or plastic to cover table surfaces.

1. Have kids put their name on the back of their card stock. Black cardstock is a fun option!

2. Brainstorm ideas of what they could create using their glue bottle as a drawing tool. (Demonstrate examples on a sheet of cardstock using the glue bottle). Kids can simply make designs or use their pencil to create a simple picture

3. Use glue to trace or create designs on the card stock

4. Carefully sprinkle salt onto cardstock until the glue is thoroughly covered. Tip to let excess salt fall away. Use a baking dish or tray to contain the excess salt so it can be reused on another project.

5. Dip the paint brush into diluted food coloring paint then gently touch to the salt-covered glue lines. Watch the paint travel in both directions as the salt absorbs the liquid! It's almost like magic- except it's SCIENCE!

6. Important --Use only a little water color at a time!!!

7. Let dry thoroughly. (may take a full day or two). The color of the dye will fade as it dries.

TIPS:

The students are also learning about primary and secondary colors through this activity. In order to give them a hands on experience with creating the secondary colors, you can make primary colors and the kids can allow two primary colors to touch on the salt paintings to make a secondary color.

REFLECTION:

questions to ask after this experience

1. Go over the colors again. What colors are primary? What colors are secondary? How does the rainbow reflect the relationship between the primary and secondary colors?

2. What surprised you the most when you saw the food coloring spread through the salt, and why do you think that happened?

3. How did you decide which colors to use, and what effect did you notice as the colors mixed together on the salt?

4. What did you learn about how salt and watercolors interact during this project, and how could you use that knowledge in other art or science projects?

SOLAR SYSTEM BRACELETS

A S.T.E.A.M. activity designed to explore our galaxy & the planets

Levels: K through 5th
Time: 10 to 15 minutes

OBJECTIVES

Constructing a Solar System Bracelet is a GREAT way to introduce students to their study of the solar system.
Although constructing the bracelet makes students more interested in the solar system, like most diagrams and models of the solar system, the bracelet does not accurately depict sizes AND distances. So, it's important to set aside time to help students understand this.

MATERIALS:

EACH STUDENT NEEDS:

- String
- Solar System Beads: you can order them here

PREPARATION

Watch these videos on the space:
Exploring Our Solar System

Watch this video on how this activity is made:
Solar System Bracelets

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

ACTIVITY

As you go through each of the planets, have the students first guess which planet is which, and
then when they guess correctly, have them put the planet on the string.

There are ten beads that look like asteroids and ten gold beads for the students to use to add their own flare to their bracelets! Allow them to put these beads on wherever they would like on the bracelet.

AFTER THIS ACTIVITY:

1. test the student's knowledge of the planets by asking them trivia! Some trivia questions are listed below the activity, but feel free to find more

ABOUT THE PLANETS:

1. Mercury: is the smallest, and the fastest planet. It goes around the sun in 88 days. It also has no moons or rings.

2. Venus: Venus takes 225 days to go around the sun. It is the second brightest object in the night sky.

3. Earth: The Earth is covered with 70% water. It takes 365 orbit the sun and its axis it tilted at 66 degrees
    a. Moon: The moon is a natural satellite to the Earth and the brightest object in the night sky. It has no atmosphere and less gravity than earth.

4. Mars: Mars is the second smallest planet and has two moons. Its atmosphere is made of mostly carbon dioxide.

5. Jupiter: Jupiter is the biggest planet in our solar system. It's like a star, but it never got big enough to start burning. Jupiter is covered in swirling cloud stripes. It has big storms like the Great Red Spot, which has been going for hundreds of years.

6. Saturn: Saturn with its unique ring system orbits the sun once every 29 years and has around 82 moons.

7. Uranus: Uranus isn’t visible without a telescope. Its axis is 98 degrees, so it rolls on its side around the sun.

8. Neptune: Neptune is the smallest gas planet and takes 165 earth years to orbit the sun. The gases in its atmosphere give it the deep blue color.

9. Pluto: Pluto is a dwarf planet, one of five. At one point, it was known as the ninth planet
of the solar system. It has 5 known moons.
Additional Facts:
10. The Sun: The sun is composed of hydrogen and helium. One million earths, approximately, could fit inside of the sun. It takes roughly eight minutes for light from the sun to reach earth

11. Asteroid Belt: The asteroid belt is located between the orbits of Mars and Jupiter. There are many asteroids, but most are fairly small and spread out inside of a large area. This allows for spacecrafts, pass through it relatively easily.

SOLAR SYSTEM TRIVIA

1. Now that Pluto is no longer included, how many planets are there in the Solar System?
A: 8

2. What is the smallest planet in the Solar System?
A: Mercury

3. What is the largest planet in the Solar System?
A: Jupiter

4. What is the hottest planet in the Solar System?
A: Venus

5. The sixth planet from the Sun features an extensive ring system, what is the name of this planet?
A: Saturn

6. The chemical element uranium was named after what planet?
A: Uranus

7. What planet in the solar system is farthest from the Sun?
A: Neptune

8. What is the second smallest planet in the solar system?
A: Mars

9. What planet is closest in size to Earth?
A: Venus

10. The moon Titan orbits what planet?
A: Saturn

11. What planet is nicknamed the 'Red Planet'?
A: Mars

12. True or false? Neptune is larger than Saturn.
A: False

13. The Galilean moons orbit what planet?
A: Jupiter

14. What planet is closest to the Sun?
A: Mercury

15. What is the seventh planet from the Sun?
A: Uranus

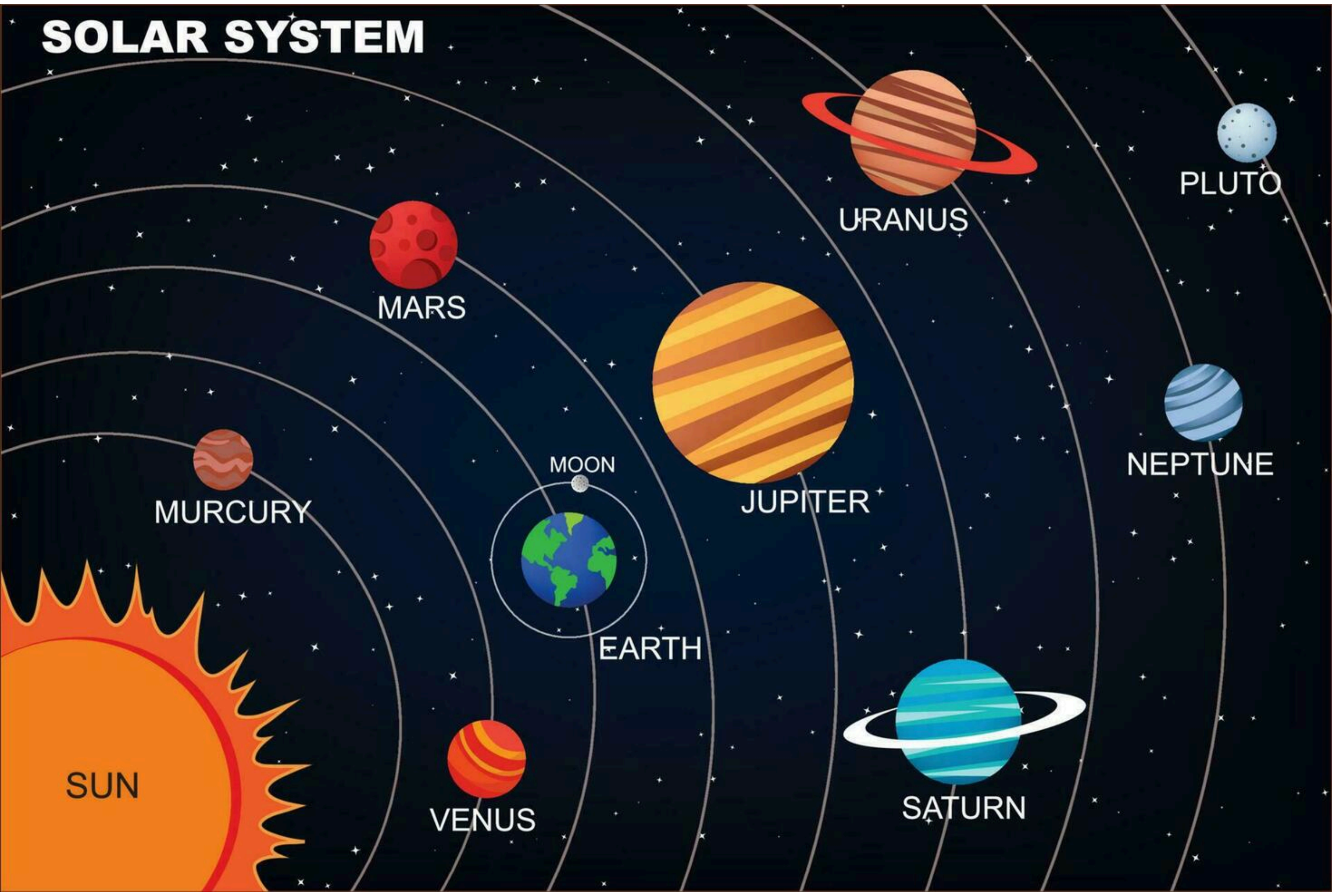
16. True or false? Venus has more atmospheric pressure than Earth?
A: True

17. Triton is the largest moon of what planet?
A: Neptune

18. What is the brightest planet in the night sky?
A: Venus

19. What is the third planet from the Sun?
A: Earth

20. Phobos and Deimos are moons of what planet?
A: Mars


SOLAR SYSTEM
URANUS
PLUTO
MARS
JUPITER
NEPTUNE
MOON
MURCURY
EARTH
SUN
VENUS
SATURN

—COOL SPACE FACTS—

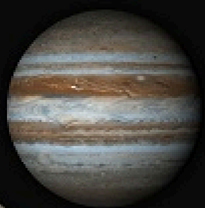
THE SUN MAKES UP 99.86% OF THE SOLAR SYSTEMS MASS

MERCURY IS NAMED AFTER THE ROMAN MESSENGER TO THE GODS

VENUS SPINS IN THE OPPOSITE DIRECTION TO MOST PLANETS

THE EARTH IS 149,598,262 KM FROM THE SUN

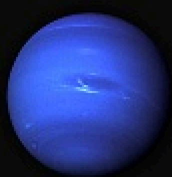
MARS IS HOME TO OLYMPUS MONS THE SOLAR SYSTEMS TALLEST VOLCANO



JUPITER IS LARGE ENOUGH FOR THE EARTH TO FIT INSIDE 1,000 TIMES

SATURN HAS THE SECOND LARGEST MOON IN THE SOLAR SYSTEM, TITAN

URANUS IS COLDEST PLANET IN THE SOLAR SYSTEM



NEPTUNE ORBITS THE SUN ONCE EVERY 165 YEARS

MORSE CODE BRACELETS

A S.T.E.A.M. activity designed to explore the topics of the center of gravity

Levels: K through 5th
Time: 20 to 30 minutes

OBJECTIVES

Morse Code is a code for translating letters to dots · and dashes —. These represent a short and long signal duration. As 'code talkers' grew more and more comfortable with Morse Code, they eventually stopped needing to reference an alphabet chart, and could translate letters just by hearing the long and short beeps. This led to the development of Morse Code as a spoken language rather than just a written one

PREPARATION

Watch this video on the history of Morse Code:
The History of Morse Code

Watch this video on how Morse Code Works:
How Morse Code Works

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

ACTIVITY

1. Print out Morse Code sheets and have the students take a few minutes to look at the card.
2. Use one color of beads for dots and dashes, and the other color for spaces between letters
3. Have the students write out what they want their bracelet to say, their name or a little message, and then have them use the morse code cheat sheet to put the beads on the string so that they spell out their message.
4. Tie a slipknot to secure the bracelet.
5. Go around in a circle and have the students use their morse code cheat sheets to guess what others students' bracelets say!

MATERIALS:

EACH STUDENT NEEDS:

- String
- Morse Code Beads for Bracelet: you can order them here
- Morse Code Cheat Sheet (attached)

ABOUT MORSE CODE

Samuel Morse developed the code in the 1830's to send messages through the telegraph machine.

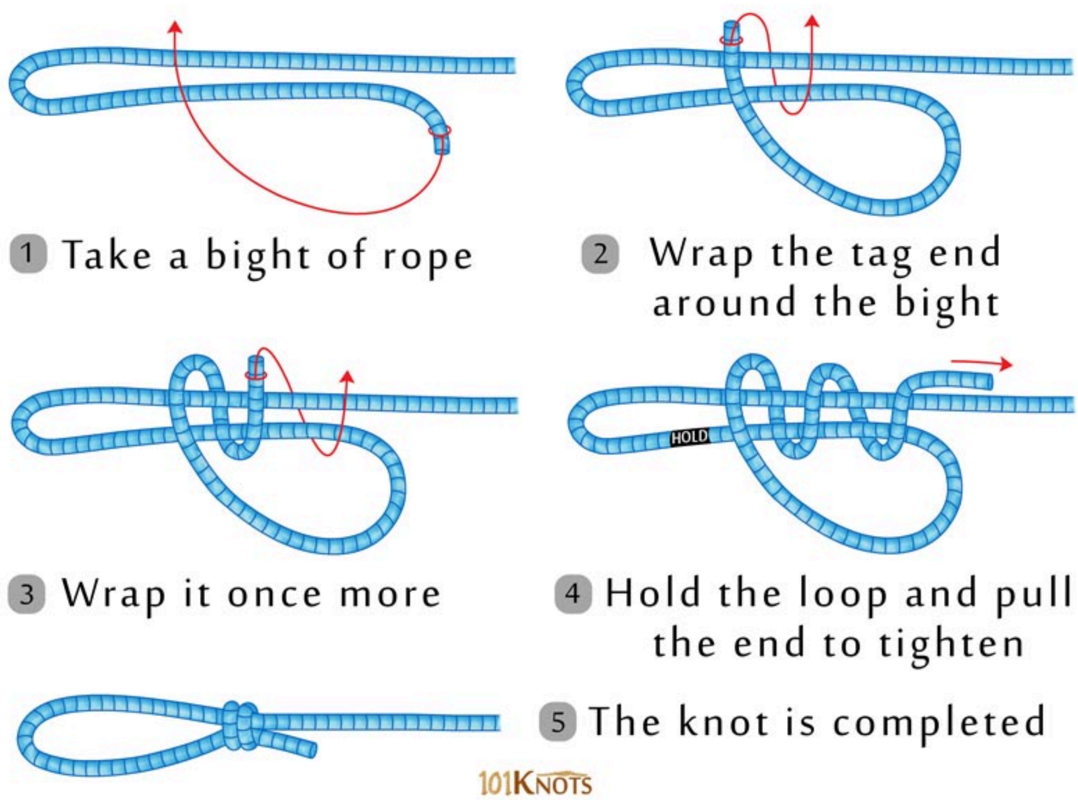
How Does it Work?
Electrical signals are translated to auditory or written dots and dashes.
-Played a critical role in World War II for the NAVY. It was more secure and traveled a longer distance than voice telephone!

Fun Fact:
Morse code was designed so that the length of each symbol is inverse to its frequency of occurrence in the English language (more common=shorter and vice versa)
◦ The most common letter in the English language is 'E', thus the Morse code for 'E' is a single dot: ·
◦ The next most common letter is the letter 'T', thus the Morse code for 'T' is a single dash: —

Morse Code Alphabet

A	•-	N	-•	0	-----
B	-•••	O	---	1	•----
C	-•-•	P	•--•	2	••---
D	-••	Q	--•-	3	•••--
E	•	R	•-•	4	••••-
F	••-•	S	•••	5	•••••
G	--•	T	-	6	-••••
H	••••	U	••-	7	--•••
I	••	V	•••-	8	---••
J	•---	W	•--	9	----•
K	-•-	X	-••-	.	•-•-•-
L	•-••	Y	-•--	,	--••--
M	--	Z	--••	?	••--••

Slip Knot Instructions



MELTING PLASTIC SUN CATCHERS

A S.T.E.A.M. activity designed to explore the states of matter

Levels: K through 5th
Time: 20 to 30 minutes

OBJECTIVES

This activity aims for children to create colorful, personalized suncatchers by decorating plastic cups with permanent markers, shrinking them in the oven, and then hanging the finished product. The process allows kids to transform their drawings into unique pieces of art, along with exploring, hands-on, the states of matter and their transitions!

PREPARATION

Watch these videos of an explanation of the science behind this activity:
DIY Melted Plastic Sun Catchers
States of Matter

Watch this video on how this activity is made:
Melting Plastic Sun Catchers

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

MATERIALS:

EACH STUDENT NEEDS:

- permanent markers – Like sharpies
- Clear Plastic Cup (recycle #6 ONLY) 5 or 9 oz sizes work great - Other cups WILL NOT MELT correctly
- hole punch
- Scissors
- string for hanging
- cookie sheets
- Foil to cover cookie sheets
- oven: preheated to 400 degrees

BACKGROUND INFO

Let's talk about the states of matter! Matter is everything around us, and it comes in three main forms: solid, liquid, and gas.

1. Solids
A solid is something that has a shape that doesn't change easily. Think of a rock, a toy, or an ice cube. These things stay the same shape unless you break them or cut them.

2. Liquids
A liquid is something that can flow and take the shape of its container. Think of water, milk, or juice. If you pour it into a cup, it will take the shape of the cup, but it can also spill and move around.

3. Gases
A gas is something that you can't always see, and it spreads out to fill any space it's in. Think of air or the steam from boiling water. Gases don't have a shape of their own.

VOCABULARY

Words to know for this experiment

Solid: a state of matter that maintains its own shape instead of conforming to the shape of its container.

Liquid: has a definite volume but not a definite shape. Instead, liquids take on the shape of the vessel they are in.

Melting: to change from a solid to a liquid state usually through heat

Melting Point: the temperature at which it changes from a solid to a liquid. At this temperature, the solid and liquid phases are in equilibrium.

Matter can change from one state to another! Here's how it works:

Melting (Solid to Liquid):
When you heat up a solid, like ice, it melts and turns into a liquid, like water.
Freezing (Liquid to Solid):
If you cool down a liquid, like water, it freezes and becomes a solid, like ice.
Evaporation (Liquid to Gas):
When a liquid gets hot enough, it can turn into a gas. This is called evaporation.
Condensation (Gas to Liquid):
When a gas cools down, it can turn back into a liquid.
Sublimation (Solid to Gas):
Sometimes, a solid can turn directly into a gas without becoming a liquid first.

These changes happen because of temperature. When things get hotter, they often move from solid to liquid to gas. When they get colder, they can move from gas to liquid to solid. Understanding the states of matter and how they change is like learning the magic of how everything around us works!
Melting plastic sun catchers involves a phase transition from solid to liquid that occurs when the plastic's crystalline structure is heated and vibrated enough.

ACTIVITY

1. Cover table surfaces to protect from permanent markers.

2. Draw with permanent markers on plastic cups. (Encourage creativity!) The more color the better.

3. Hole punch the cup in one place around the rim – you will not be able to punch a hole in them once they melt.

4. Place on cookie sheet covered with foil and put in preheated oven (400 degrees) You may want to do a trial run in your oven beforehand as all ovens are a bit different

5. Turn the oven light on and watch until the cup shrinks down to a flat circle. Note that only the suncatcher in the middle of the cookie sheet will be completely flat. A pancake flipper can be used to help flatten each suncatcher once they come out of the oven.

6. Allow to cool a few minutes before having the kids pick up and handle.

7. Thread a string through the hole and hang in a window or on a tree outside.

TIPS:

It is important to work in a well-ventilated area. When melting beads, they omit a strong odor. Don't worry, it is not toxic because pony beads are meant to be melted. Secondly, use an old cookie sheet as a work surface. It helps to use one with a lip in case the beads roll around. Melting beads can burn the metal sheet, however, can easily be cleaned

REFLECTION

Questions to ask after the activity:

How did you decide what designs and colors to use on your cup, and what inspired your choices?

What did you notice about how the plastic cup changed in the oven, and why do you think that happened?

What are some other examples of states of matter? Go through each state and have the students give examples of each!

What are some other examples of transitions between states of matter? Go through each transition have have the students give examples of each!

TIE-DYING W/ PERMANENT MARKERS & RUBBING ALCOHOL

Levels: K through 5th
Time: 35 to 45 minutes

OBJECTIVES

Here's a quick and creative way to add a pop of color or fun design to your clothes: With only a handful of affordable materials, kids and adults alike will love this project, which uses Sharpie's to create designs on t-shirts.

PREPARATION

Watch these videos on the science behind this experiment:
Sharpie Pen Tie Dye

Watch this video on how this activity is made:
How to Tie Dye with Sharpies

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

ACTIVITY

Permanent marker ink doesn't dissolve in water, but special chemicals called solvents can break it down. Rubbing alcohol is one of these solvents. In this project, when you drip alcohol on the cloth, it dissolves the colorful ink and carries it through the fabric.
Rubbing alcohol — Ethyl alcohol or isopropyl alcohol (often
called 'rubbing alcohol') is very effective at breaking down the chemicals in permanent inks.
The fabric of the shirt absorbs the dye molecules from the marker, similar to a sponge absorbing water.

Real-life Application to discuss: This is handy to know if you get permanent markers on clothing or other surfaces. Liquids with alcohol in them (such as hand sanitizer, hair spray or rubbing alcohol) can help remove the marker.

MATERIALS:

EACH STUDENT NEEDS:

- Plastic cups (at least 2 per student)
1. Rubber bands (at least 2 per student)
- Colorful assortment of permanent markers
- 70% isopropyl alcohol, also called rubbing alcohol in small containers
- Medicine dropper/pipette for each student
- White bandana that can be dyed (cotton fabric works best)
- Plastic rolled tablecloth to protect your work surface.
- Optional: Hair dryer
- Masking tape to put names on each bandana
- Paint shirt for each student

TIPS:

Do not go super crazy with the rubbing alcohol. Start with a maximum of five drops in the center and spread the rest out. It is probably safe to assume that most designs will not need more than 15 drops total. The alcohol will continue to spread long after you think it won't. You can always come back and add a few more drops around the edges if the design did not spread enough, but you can't take it back if it went too far.

ACTIVITY

Demonstrate each step below with kids watching before having the kids create their own. Do a quick tutorial on using a pipette).

1. Lay out the bandana on the surface you will be dyeing it on.

2. Wherever you want to make a design on the bandana, place a plastic cup underneath the bandana and then loop a rubber band around the edge of the cup. This should end up making a flat, tight circle of bandana fabric stretched over the opening of the cup. Do this to at least two places on the fabric so that you have at least two flat circles to draw in.

3. Use the permanent markers to draw some colorful designs in each flat t-shirt circle that you made with the cups. Fill in at least two flat circles with your drawings.

4. Now use the medicine dropper to drop a few drops of isopropyl alcohol onto the center of one of the other flat circles that you drew in. DO NOT overwet the marker lines or fabric. Use colors that complement one another to avoid a “muddy outcome.” It can take a few moments for the colors to blend.

5. Repeat the tie-dye process in other areas of the bandana. Keep the fabric flat and not touching the other areas of the fabric when it is wet, as it will bleed easily.

6. Allow to dry before sending the project home. Use masking tape to put kids’ names on their bandanas.

ASK THESE QUESTIONS:

Before, After, or During the Experiment

1. Why do you think the rubbing alcohol made the colors spread out?
2. What was your favorite part of the tie-dye process?
3. If you could do this project again, what would you do differently?
4. Why do you think the colors look different on the fabric compared to how they look on the marker?
5. What do you think would happen if we used a different type of fabric?
6. Can you create a design with markers that looks like something in nature (like a flower or a rainbow)?
7. Why do you think tie-dye is a popular way to decorate clothes?

WIRE SCULPTURES

Levels: K through 5th
Time: 35 to 45 minutes

OBJECTIVES

The objective of this activity is for kids to create their own bead and wire maze by sanding a wood block, inserting and securing wire, and stringing beads onto the wire. By engaging in this project, children learn about the properties of materials, such as wood and wire, and develop fine motor skills through sanding and assembling. The activity also encourages creativity as kids design their own mazes and use markers to decorate their wooden blocks. Additionally, children practice problem-solving and spatial reasoning as they twist and shape the wire to form a functional maze.

PREPARATION

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

Pre-cut wood blocks from scrap wood. 2x4s work well. The blocks do not need to be exact cubes.
Use a small drill bit to pre-drill holes in each block. 4 holes on top and about 6 random holes around the sides.

ACTIVITY

1. Kids select a wood block and use sandpaper to sand off rough edges around the holes.
Demonstrate how to sand the wood, going with the grain of the wood.
2. Kids select 3-4 lengths of wire.
3. Kids fit ends of one wire into the side of the block of wood.
4. Use the cool glue gun to glue one end of the wire in place.
5. Kids string a few beads onto the wire and then twist and shape the wire as desired.
Place the loose end of the wire into another hole. Secure the loose end of the wire with glue.
6. Repeat until wires and beads have been used and all ends have been glued.
7. Slide the beads along the wire – they've made their very own wood and bead wire
maze!
8. Kids can use markers and embellishments to decorate the wood block if time allows.

MATERIALS:

EACH STUDENT NEEDS:

- Flexible gardening Wire – cut into 12-16" sections 3-4 wire sections/student.
- Wood blocks cut from scrap wood.
- Sandpaper cut into 4x4" pieces for each student
- Drill and drill bit (the bit will need to be a smidge larger than the wire)
- Sharp scissors
- Cool temp glue guns
- Pony Beads
- Markers
- Embellishments (stickers,gemstones, etc.)

REFLECTION

questions to ask after the activity

How did you decide on the design and arrangement of the wire and beads, and what challenges did you encounter while shaping the wire?

What did you learn about the materials you used, and how did the properties of the wood and wire impact your maze?

How did decorating the wood block with markers enhance your project, and what additional embellishments would you consider adding if you had more time?

If you could make another maze, what would you do differently to improve its design or functionality?

EGGSHELL GEODES

Levels: K through 5th
Time: 2 Days

OBJECTIVE

This activity is "egg-citing"! In this activity, students will learn about solutes, solvents, and solutions, while discovering saturation and supersaturation. Students will be able to observe sedimentation causing crystals to form on the surface of the eggshell. The result is a phenomenal eggshell geode!

PREPARATION

Watch these videos for an explanation of the science behind this experiment & how this experiment is made:
Egg Shell Geodes

It's best to do this experiment at least once before teaching the students to 1) ensure you know how the experiment works, and 2) to have a few examples of what the project will look like.

BACKGROUND INFO

Liquids, or solvents, are restricted to dissolving a specific amount of solute, or what is being dissolved. At room temperature, the solvent can only dissolve a specific amount and the rest of the solute will not dissolve. This solution (the solvent and solute mix) is saturated, meaning it cannot dissolve any more solute. At room temperature, the water molecules move around at a certain speed and can only break apart a specific amount of the solid, as shown in the beaker on the left. However, when the solvent is heated, it can dissolve much more solute than at room temperature.

When the solvent is heated, the molecules in the water move around more quickly, causing more collisions between the water molecules and the solid, breaking more of the solid apart, as shown in the beaker on the right. When more solute is dissolved in the heated solvent, it is called supersaturated.

MATERIALS:

EACH STUDENT NEEDS:

- 2 Eggs
- Straight pin or safety pin
- Liquid glue • Paintbrush
- ¾ Cup plus 2 tablespoons Alum powder (can be bought in the spice aisle at the grocery store)
- 2 Cups hot water
- Saucepan
- Food coloring (up to 4 colors!)
- 4 Glasses
- Spoon
- Paper towels

VOCABULARY

Words to know for this experiment:

Solvent: a substance that can dissolve other substances to form a solution

Solute: the substance that dissolves to form a solution

Supersaturation: containing an amount of something greater than the amount required for saturation by having been cooled from a higher temperature to a temperature below that at which saturation occurs

Sedimentation: the process of particles settling out of a fluid and coming to rest against a barrier

Crystallization: the process of formation of large crystals in a pure state from their solutions

Geode: rocks that are plain on the outside but can have beautiful crystals on the inside

Precipitates: The liquid and solid water particles that fall from clouds and reach the ground

Geology: study of the Earth

As the solution cools, the solute "falls out" of the solvent (precipitates), creating crystals. This process is called sedimentation. Sedimentation occurs naturally when there is a hollow space caused by groundwater dissolving existing structures within rocks. Minerals that are present in the groundwater are deposited into the inside of the space when the temperature causes the water to evaporate, leaving more minerals than can "fit" in the water.

Over time, this creates the amazing geodes that we see today. A well-known example of supersaturation is seen in the process of making sweetened tea. When the tea is cold, very little sugar can dissolve in the tea. This is because the molecules are not moving very much. If the tea is stirred, a little more sugar will dissolve because the molecules are moving a little more. However, if the tea is heated and then the sugar is added, much more sugar can be added to the tea due to the fast-moving molecules.

DAY 1

1. Remove the yolk by poking a hole in both ends of the egg with a pin and blowing on one end, causing the yolk to come out on the other end.
2. Separate the eggshell in half lengthwise.
3. Clean and dry the eggshell.
4. Using a paintbrush, spread enough glue to coat the inside of the eggshell. If you would like the crystals to grow along the edges of the shell, make sure to add glue there too.
5. Sprinkle the 2 tablespoons of alum powder over the glue on the eggshell.
6. Gently tap the excess alum powder out of the eggshell.
7. Allow the eggshell to dry overnight or for several hours. If the glue is not completely dry, the alum powder will fall off and crystals will not attach to the eggshell.

ADD ON TO THE CRAFT

For a fun video, watch Magic School Bus Rides Again Season 1, Episode 8 "Three in One" on Netflix.

This episode shows the three forms of water in a solid, liquid, and gas and can help students to understand molecular movement.

DAY 2

1. Bring 2 cups of water to a boil in a saucepan. Turn off the heat source once the water is boiling.
2. Add ¾ cup of alum powder to the hot water and stir until the powder is dissolved.
3. Divide the mixture into four separate glasses.
4. Add at least 25 drops of food coloring to each glass and mix until the color is spread throughout the glass.
5. Let the solution cool to room temperature
6. Gently place one eggshell half in each of the glasses using the spoon to lower the shell to the bottom. Make sure to put the alum side up.
7. The eggshells should sit in the solution for at least 12 hours. The longer the eggshells are in the solution, the larger the crystals will be!
8. Carefully remove the eggshell geodes from the glasses using a spoon.
9. Place the geodes on a paper towel to allow them to dry. Be careful handling the geodes as they are very fragile and the crystals can fall off easily from the edges.

REFLECTION:

1. What process causes the crystals to form?

Geodes form through sedimentation. When a room temperature liquid is not able to dissolve any more solute, in this case alum powder, the solution is called saturated. When the liquid is heated, it can hold more solute than it normally would and is supersaturated. As the water cools, the alum begins to "fall out" of the water (precipitate), creating crystals that form on the eggshells. This process is called sedimentation!

2. What would you expect to happen if the water was not boiled before adding the alum powder?

The water would be unable to dissolve as much of the alum powder and would not be able to become supersaturated. As the supersaturated water cools, the solute (the alum) separates from the water and crystalizes onto the eggshell. Without the supersaturated solution, the alum would not be able to crystalize onto the eggshell unless the water evaporated.

REVIEW

what have we learned?

Review

What have we learned?

Review

Create a dialogue with the students about what they have learned. Ask questions about each activity and lab they have completed and discuss how each activity has helped them become better engineers. Let the students take turns and discuss with an open conversation

Questions

Let the students have an open discussion on what they have learned. If you feel as though you won't need questions to direct the conversation, don't use them! If you have other questions you would like to ask, ask them! This review is completely up to you and the students- let them take the lead on the discussion!

1. Creativity and Innovation:
    a. How can creativity in art influence the development of new technologies?
    b. Can you think of a time when an artistic approach helped solve a technical problem?
2. Design and Functionality:
    a. Why is good design important in engineering and technology?
    b. How do you think principles of art, like balance and symmetry, play a role in product design?
3. Visualization and Communication:
    a. How can art help in visualizing complex scientific or mathematical concepts?
    b. What role does visual communication play in the success of a STEM project?
4. Problem-Solving:
    a. In what ways do the problem-solving processes in art and STEM overlap?
    b. How can experimenting with different materials or ideas in art improve your problem-solving skills in STEM?
5. Human Connection and Empathy:
    a. How can art help make technology more user-friendly and accessible?
    b. Why is it important to consider the human experience when designing new technologies?
6. Interdisciplinary Learning:
    a. How can combining art with STEM subjects lead to new discoveries or innovations?
    b. What are some examples of careers or projects where art and STEM intersect?
7. Art in STEM Education:
    a. How does including art in STEM education benefit students?
    b. What are some ways that art can be integrated into STEM lessons or projects?

THE EDGERTON EXPLORIT CENTER
www.edgerton.org

THE EDGERTON EDUCATION FOUNDATION
208 16TH STREET,
AURORA, NEBRASKA 68818

402-694-4032
EDGERTON.ORG
MARY@EDGERTON.ORG