splish splash

water science club

THE EDGERTON EXPLORIT CENTER

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What Is Water?

What Is Water?

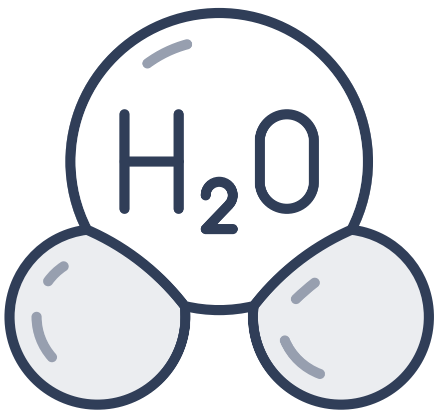
Water is the liquid that makes life on Earth possible. All living things, from tiny cyanobacteria to giant blue whales, need water to survive. Without water, life as we know it would not exist. And life exists wherever there is water.

Water is a tiny molecule. It consists of three atoms : two of hydrogen and one of oxygen. Water molecules cling to each other because of a force called hydrogen bonding. It's the reason why water can do amazing things.
Water is a shape-shifter. It exists in three states on Earth: liquid, gas, and solid:

- Liquid water is a jumbled bunch of water molecules. It comes out of our faucets, flows underground and in rivers and oceans, and forms clouds and fog in the air.
- When water molecules escape from liquid water and float into the air, they turn into an invisible gas called water vapor. The spaces between the molecules are much bigger than the molecules themselves.
- When water freezes into a solid, it does a strange thing: it floats! (Most other solids become denser and sink.) As ice forms, water molecules arrange themselves neatly in a crystal structure. The empty spaces between the molecules act as flotation devices — the way a life preserver holds you up.

Why is Water Important?

Have you noticed that everything alive needs water? Your pets, trees, and your family, too. So why do you think that is? It's true that our bodies and other living things are made from all sorts of different things but water makes up a lot of it. Also, when you look at a globe of Earth, there really is a lot of water! Scientists have found that all living things need water. So, if we would like to try to find living things from some other planet, then maybe we should look for places that also have water.



Water Facts

Water Facts

Fun Facts

- Water is always changing states between liquid, gas (vapor), and solid (ice).
- Energy from the sun continually moves water through the water cycle.
- The force of gravity pulls water down through the water cycle.
- here is the same amount of water on Earth as there was when the Earth was formed. The water from your faucet could contain molecules that dinosaurs drank.
- Nearly 97% of the world's water is salty or otherwise undrinkable. Another 2% is locked in ice caps and glaciers. That leaves just 1% for all of humanity's needs — all its agricultural, residential, manufacturing, community, and personal needs.
- Water regulates the Earth's temperature. It also regulates the temperature of the human body, carries nutrients and oxygen to cells, cushions joints, protects organs and tissues, and removes wastes.
- 75% of the human brain is water and 75% of a living tree is water.
- A person can live about a month without food, but only about a week without water.
- Water is part of a deeply interconnected system. What we pour on the ground ends up in our water, and what we spew into the sky ends up in our water.
- The average total home water use for each person in the U.S. is about 50 gallons a day.
- Water expands by 9% when it freezes. Frozen water (ice) is lighter than water, which is why ice floats in water.

Frequently Asked Questions

- How does heat from the Sun turn liquid water into a gas called water vapor?
  - The energy from the Sun increases the energy of the water molecules when they are heated. This causes the water molecules to vibrate or move faster until some of them escape to become water vapor.
- Explain how energy from the Sun drives the water cycle.
  - The Sun's energy evaporates water into the atmosphere from all types of sources, including bodies of water, plants, and animals. This water eventually falls back to Earth and moves along Earth's surface until it is evaporated again by the Sun. The energy from the Sun is a driving force that gets the water cycling in and out of the atmosphere.
- How do plants contribute to the water cycle?
  - Water travels from the soil, through the plant, and then evaporates from the leaves into the atmosphere.

Who Studies Water?

Who Studies Water?

Hydrologists study the scientific aspects of water on Earth, including its properties, distribution, circulation, and occurrence. They use their knowledge to solve water-related problems, such as finding water supplies for cities and farms, controlling soil erosion and river flooding, and assessing the impact of hydropower plants on surface water, groundwater, and sedimentation.

Within the hydrology field, there are options for specializing. Hydrologists tend to specialize in a component of the hydrologic cycle or in a particular water source. For instance, some hydrologists specialize in the evaporation of water and its journey to the atmosphere.
The most common hydrology specializations are as follows:

- Surface water hydrologists: These professionals study bodies of water above ground, including lakes, rivers and snowpacks. They might focus on work such as flood forecasts and flood management programs, or they might predict future water levels.
- Groundwater hydrologists: These hydrologists specialize in the water found below the Earth's surface. They might focus on the cleanup of contaminated groundwater reserves, identification of ideal locations for wells, identification of locations for hazardous waste disposal, or prediction of the future water supply.

The typical daily job description for a hydrologist will vary depending on their specialization, employer and current projects. In general, however, a hydrologist may do any of the following tasks:

- Go out into the field to collect water and soil samples for analysis, and to use monitoring equipment to measure the properties of water bodies, such as the volume of a river
- Analyze collected samples for problems, such as contaminants
- Evaluate data on the effects of pollution, drought, erosion and similar issues
- Use computer models to predict events, such as droughts, floods, water supply availability and pollution migration
- Assess the environmental impacts of various projects, ranging from hydroelectric power plants to wastewater treatment facilities
- Prepare charts, graphs and written reports of their findings, and present their findings to clients or other stakeholders

The job of a hydrologist requires both independent and collaborative work. Hydrologists frequently coordinate their work with environmental science technicians, biologists, engineers, other scientists and public officials. For instance, a hydrologist might connect with an elected official to discuss water management plans for a city, or the hydrologist might work with a biologist to assess the effects of water pollution on local wildlife.

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.

INTRODUCTION

an intro into water

WATER RACE RELAY

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

OBJECTIVES

The objective of this sponge relay game is for teams to transfer water from one bucket to another using a sponge, racing to fill the finish line bucket to a marked level. By playing this game, kids can learn about teamwork, as they must work together efficiently to complete the task. The game also helps develop coordination and physical endurance, as players need to run back and forth while managing the sponge. Additionally, children can gain an understanding of volume and measurement as they observe the water level rising in the bucket.

MATERIALS:

EACH STUDENT NEEDS:

- Buckets
- Large Spoons
- Towels

PREPARATION

Watch this video on how this activity is made:
Water Relay

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.

AS YOU PLAY

Encourage the players to use proper communication and teamwork skills and use this game as an opportunity to practice patience.

ACTIVITY

1. Fill each buck with water and place at the starting line.
2. Put an empty buck for each team at the finish line. Mark a line inside the bucket where the water needs to, be filled.
3. Have the first player dip their sponge into the bucket of water. Then, the player runs to the other bucket and wrings out the sponge into the empty bucket. Next, the player runs back to the starting line and hands the sponge to the next player.
4. Play continues until the bucket at the finish line is filled to the line.

ALTERNATE IDEAS

Instead of using sponges, have the kids transport the water in plastic cups. Players fill the cups and race them to the finish line. Then, switch players.

REFLECTION

What strategy did your team use to transfer water as quickly as possible, and how did it help you fill the bucket?

What was the most challenging part of the relay, and how did you and your teammates overcome it?

DON'T BREAK THE ICE

A team building activity designed to teach good sportsmanship

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

OBJECTIVES

Good sportsmanship is important to scientists for several reasons, just like it is in sports. Scientists often work in teams and need to collaborate with others to solve complex problems. Good sportsmanship helps them communicate effectively, share ideas, and respect each other's contributions.
In summary, good sportsmanship helps scientists work together effectively, maintain ethical standards, respect others, handle challenges gracefully, and inspire positive change. It's all about being a good teammate and a fair player, whether in the lab or on the field!

PREPARATION

Watch this video on how this activity is made:
Don't Break The Ice

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:

- 1 cup
- 1 Kleenex tissue (separate multi-ply tissues into single layers of tissue)
- 1 rubber band
- 1 toothpick
- 5 dice

BEFORE THE ACTIVITY:

Before beginning the game, discuss that this is a "FOR FUN GAME." Someone will finish first each time and they get to practice being good sports and using kind words.
Have an adult demonstrate what sportsmanship doesn't look like. (EX- Crossing arms and angrily saying, "I never win!" Looking angry and saying, "NO FAIR." or "You cheated!" or "I Quit!)" Exaggerate the actions and make it fun.

Next, have the kids demonstrate what it "looks" and "sounds like" to be a good sport. (Examples – good job! Wow- way to go! High five, fist bumps). Have them practice with a neighbor.

VOCABULARY

Words to know for this activity:

Good Sportsmanship: a respectful and generous attitude that people show while playing or watching a sport, or participating in any type of contest. It includes treating others with respect, playing fair, and following the rules of the game.

Teammate: a member of the same team or group

Communication: he act of giving, receiving, and sharing information -- in other words, talking or writing, and listening or reading. Good communicators listen carefully, speak or write clearly, and respect different opinions

RULES:

1. You cannot move a die once it's on the tissue

2. When poking holes, you must get at least half of the toothpick below the tissue surface

3. You cannot poke in the same spot more than once

4. If you Roll a 1 you must add one die to the 'ice'

ACTIVITY:

1. Put kids into groups of 3-4 players.

2. Give each player a cup, tissue, rubber band, 5 dice, and a toothpick. Instruct the players to create the 'ice' by unfolding their tissue and laying it across the top of the cup. Use the rubber band to secure the tissue to the cup and create a flat surface. Each player adds one die to the 'ice' surface. Roll one die to determine the starting player. The highest roll begins by rolling two dice. The total of the dots determines the number of holes that the player must poke into the tissue.

3. If a 1 is rolled, they must add that die to the top of the cup (you can never have more than 4 dice on your cup).

Play continues in a counter-clockwise rotation. If any dice fall into the base of the cup, that player is out. The winner is the last player with dice on top of the ice.

4. **The Fun Part**: Players will come up with all kinds of strategies on how to puncture their tissues. Some will poke the tissues evenly; others will try to keep all their holes in a central spot. Regardless of their game plan, most dice will be dangling through the tissues within a few minutes of play.

WATERY WEATHER

A Beginners Guide to Engineering

Weather

How does Weather Relate to Water?

What is Weather?
Weather is the state of the atmosphere at a particular time and place. It includes factors like temperature, humidity, wind, precipitation (rain, snow, sleet), and cloudiness. Weather can change frequently, from sunny and warm to rainy and cold, depending on various atmospheric conditions.

How Does Weather Relate to Water?
Water plays a crucial role in weather through several key processes:

- The Water Cycle: The water cycle is a continuous process that moves water between the Earth's surface and the atmosphere. It involves:
    - Evaporation: Water from oceans, rivers, lakes, and even plants turns into water vapor and rises into the atmosphere.
    - Condensation: As water vapor cools, it turns back into liquid droplets, forming clouds.
    - Precipitation: When these droplets combine and grow heavy, they fall back to Earth as rain, snow, sleet, or hail.
    - Runoff: Water flows over the land, returning to bodies of water, and the cycle starts again.
    - Humidity: Humidity is the amount of water vapor in the air. It affects how we feel (e.g., humid air can feel sticky and uncomfortable) and plays a role in weather patterns. High humidity often leads to cloud formation and precipitation.
- Cloud Formation: Clouds are made of tiny water droplets or ice crystals. They form when moist air rises, cools, and condenses. The type and amount of clouds in the sky can greatly influence the weather, such as whether it will be sunny, rainy, or stormy.
- Storms and Precipitation: Water is a key component of storms. Thunderstorms, hurricanes, and other severe weather systems develop from warm, moist air rising and condensing. The amount and intensity of precipitation during these events are directly related to the water content in the atmosphere.
- Temperature Regulation: Water in the atmosphere helps regulate temperature. For example, large bodies of water like oceans and lakes can absorb and release heat, affecting local weather patterns. Coastal areas often have milder weather because of the influence of nearby water.

In summary, water is essential to weather because it drives many of the processes that create different weather conditions, from sunny days to heavy rainstorms. The water cycle, humidity, cloud formation, and precipitation are all interconnected with how weather develops and changes.

CLOUD IN A JAR

A S.T.E.A.M. activity designed to explore the topics of clouds, weather, and the water cycle

Levels: K through 5th
Time: ~15 Minutes

OBJECTIVES

In this activity, students will create a cloud inside of a glass jar. The benefit to this activity is that students are able to see the cloud forming and moving in the jar due to the hairspray. This activity could be used as an introduction to how clouds are formed and different weather systems.

Making a rain cloud in a jar is a fun and easy way to teach children how it rains. Kids will love the magical wow factor and YOU'LL love the easy prep!

MATERIALS:

EACH STUDENT NEEDS:

- Glass Jar With Lid
- 1/3 Cup of Hot Water
- Hairspray
- 1/3-1/3 Cup of Ice

PREPARATION

Watch these videos on the explanation of clouds & the water cycle:
The Water Cycle

Watch this video on how this activity is made:
Rain Cloud in a Jar

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.

VOCABULARY

words to know for this experiment:

Model: a computer simulation that uses equations to predict the future state of the atmosphere and forecast weather.

System: the movement of warm and cold air across the globe

Atmosphere: the state of the Earth's gaseous envelope at a given time and place

Demonstration: a practical exhibition and explanation of how something works or is performed.

Interactions: Earth's climate is influenced by interactions involving the Sun, ocean, atmosphere, clouds, ice, land, and life.

Formation: Clouds form when the invisible water vapor in the air condenses into visible water droplets or ice crystals.

BACKGROUND INFO

What is a cloud made of?
A cloud is simply a visible condensation of water that is suspended in the air. Clouds form as warm air rises in the atmosphere and then cools down. The sun heats water, which causes it to evaporate into the air. Warmer air rises and cooler air sinks. As the warmer air containing water vapor rises, it is cooled. As the water vapor cools, it condenses into water droplets onto particles, such as dust, in the air. As more and more air cools, more droplets are formed and create a visible cloud. When a large number of water droplets stick together, gravity pulls them back to earth, creating rain.

ACTIVITY

1. Pour the hot water into the jar.
2. Swirl the jar around.
3. Place the lid upside down on top of the jar.
4. Place the ice cubes onto the top of the lid.
5. Wait 20-30 seconds.
6. Remove the lid and quickly spray hairspray in the jar.
7. Put the lid back on the top of the jar, keeping the ice on the top just like before.
8. Watch as a cloud forms inside the jar!

THEN ASK THIS:

1. What temperature change occurred when the ice was placed on top of the hot water onto the lid of the jar?

Some of the water turned into water vapor (gas) when poured inside the jar. When the water vapor rises, it meets the cooler air near the lid with the ice and condenses onto the hairspray, forming a cloud.

2. What phase change occurred right after the hair spray was quickly sprayed into the jar and the top was placed back on? How do you know?

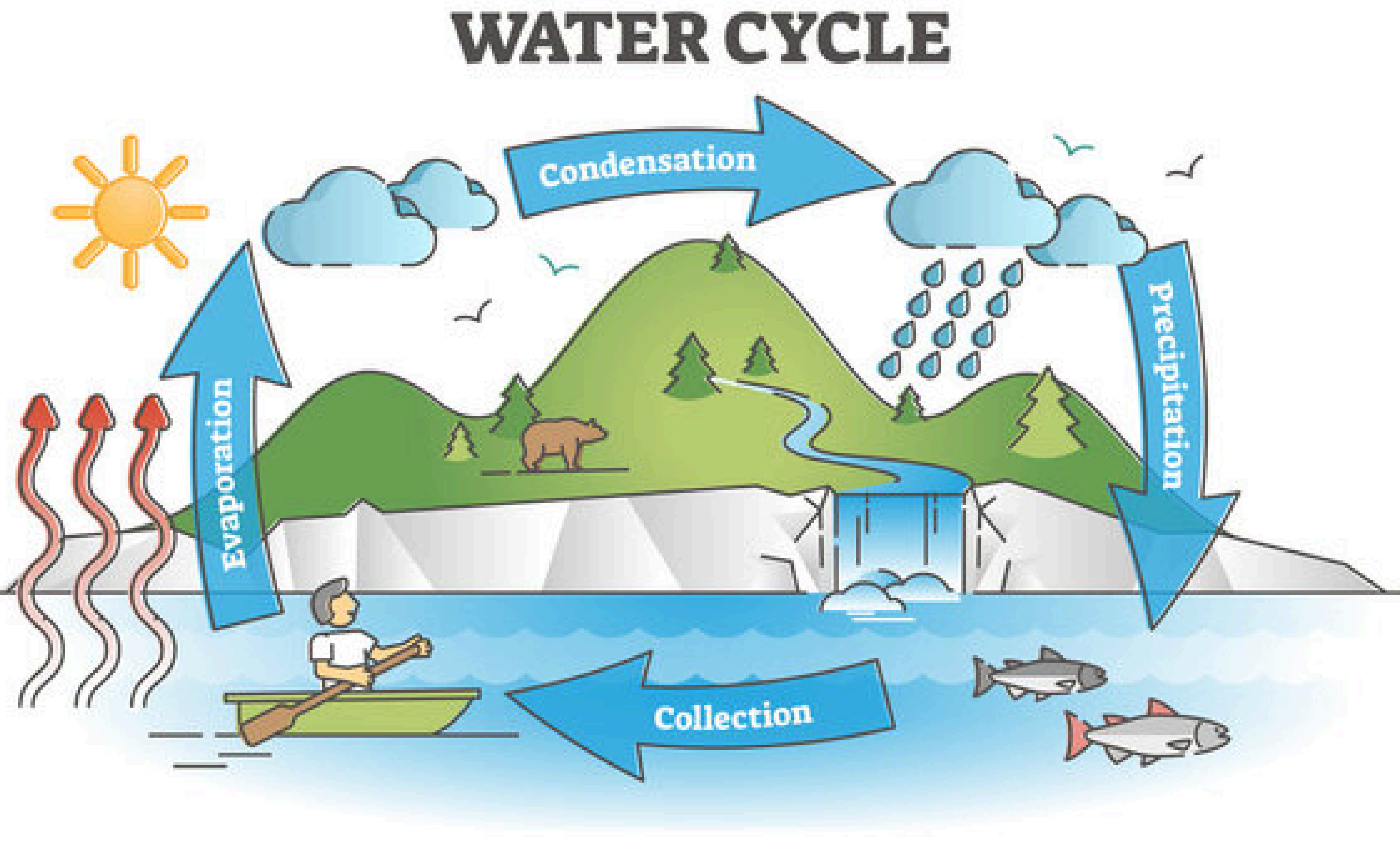
Condensation occurred when the hairspray was quickly sprayed into the jar. We know this because the water droplets condensed onto the hairspray, causing a visible cloud to form in the jar. The cloud that we see is evidence of a condensation phase change.

3. What is the cause of the swirling of the cloud?

The swirling of the cloud that is visible in the jar is caused by the air circulating. Warm air rises and cooler air sinks. When the warm air rises to the top of the jar, it is cooled by the ice on the lid. When the cool air sinks to the hot water at the bottom of the jar, it is warmed. This creates a cycle of warm air rising and cool air sinking, making a visible swirling cloud.

4. Would the cloud still form if the hairspray was not present? Why or why not?

Yes, the cloud would still form, although it may not be as visible. The water droplets condense onto any available particle- dust, dirt, or in this case, hairspray. The hairspray in this activity helps the cloud to be more visible, but it would work without it! fingertip.


WATER CYCLE
Condensation
Precipitation
Collection
Evaporation

BORAX SNOW CRYSTALS

A STEAM activity designed to explore the connections between art and chemistry.

Levels: K through 5th
Time: 15 to 20 minutes, plus 1 to 2 hours for crystals to form

OBJECTIVES

Bringing real snowflakes inside one-at-a-time is next to impossible. The snowy globs on your shoes and gloves don't count, either. So, to work around this conundrum, here's a solution using a Borax Crystal Snowflake instead of real snow. This special snowflake is almost just as beautiful and unique as a snowflake you capture from the sky. However, it won't melt and it's a heck of a lot easier to see! Besides, the Borax Crystal Snowflake uses some fun, hands-on chemistry and makes a perfect holiday experiment for a perfect holiday decoration.

MATERIALS:

EACH STUDENT NEEDS:

- Borax Powder
- Pipe Cleaners
- Plastic Disposable Cups (or Pint Jars)
- Markers and Masking Tape
- Magnifying Glasses
- Zip Sandwich Baggies

PREPARATION

Watch this video on how this activity is made: Borax Snowflakes

STEAM - Science Experiment – Borax Crystals (Grades 4-8)

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. Boil 8 cups of water in a pot on the stove.

2. Add 3 cups of borax powder to the boiling water and boil until the water turns clear. There may be a few borax grains still at the bottom of the pot but that is perfectly OK and helps the borax crystal form more quickly.

3. Pour the liquid into cups and let it cool a bit before letting the kids handle the solution.

QUESTIONS TO ASK

before, during, or after the experiment

- What is a crystal? Can you describe what crystals look like?
- What did you notice as the crystals started to form?
- What other materials do you think could form crystals? Have you ever seen salt or sugar crystals before?
- Can you think of any crystals you see in nature?
- If you wanted to grow larger borax crystals, what might you try differently next time?
- What factors do you think affect the size of the crystals?

4. Have the kids write their names on a piece of masking tape and put it on their container.

5. While the borax solution is cooling, form pipe cleaners into snowflakes shapes (or any shape they desire.)

6. Make sure the pipe cleaner shape is small enough to fit into the the container

7. Leave a longer tail of pipe cleaner to bend around a straw or hook onto the edge of the cup.

8. Lower the snowflake into the liquid and adjust the height of the pipe cleaner so that it doesn't touch the bottom or sides of the cup.

9. Set cups aside and wait at least an hour. Use magnifying glasses to watch the crystal forming process but do not pull the pipe cleaner shape out of the liquid.

10. As the solution cools it will form crystals covering the pipe cleaners and even sides and bottom of the container too!

11. Pull the crystals from the liquid and allow to dry on a paper towel before sending the project home with the kids in zip baggies.

HOW IT WORKS:

When you mixed borax with hot water, the borax spread out in the water, making it look cloudy. Hot water can hold more borax than cold water because the water molecules are moving fast and are far apart. As the water cools down, the molecules slow down and get closer together, so there's less room for the borax. The borax starts to settle and stick to tiny spots in the container, forming crystals. You'll see these crystals on the bottom and sides of the container, on the string, and on the pipe cleaner shaped like a snowflake.

SAFETY INFORMATION

Borax dust can be harmful if swallowed, inhaled, or gets into your eyes. For some people, touching it can result in a rash. Because it can be harmful if inhaled or contacts your eyes, boil the water separately, pour it into your container, and then add the borax. That minimizes dust in the air around you.

ADD ON TO THIS CRAFT:

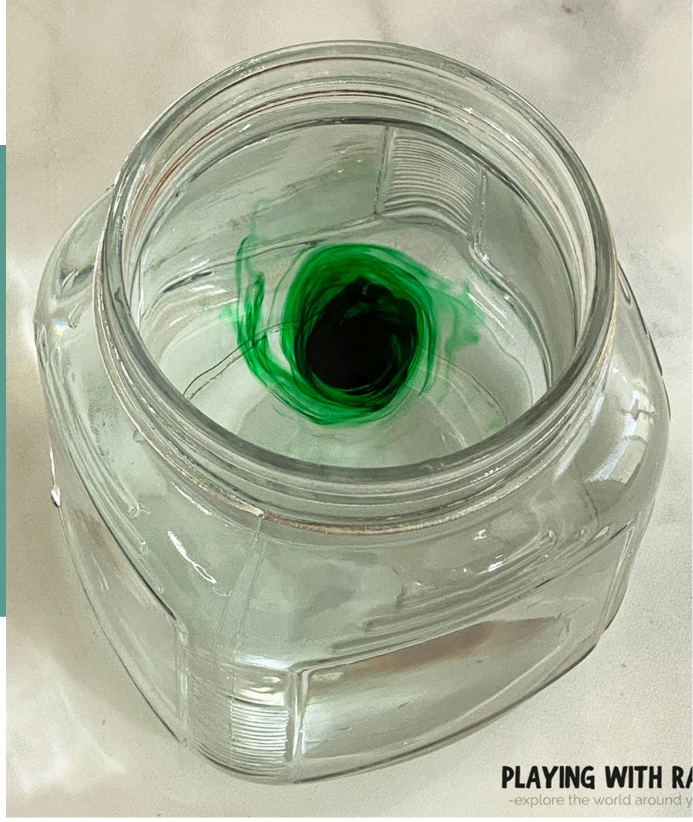
Extensions to continue this experiment:

Want a bigger snowflake? Leave it in the solution longer or make another saturated solution and soak your snowflake in it. The crystals will take up growing where they left off. Just be sure you can get your finished decoration out through the opening of the container.

HURRICANE IN A BOWL

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

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



OBJECTIVES

In this lesson, students will observe the characteristics of a hurricane through a mini-model in a clear glass bowl. Students will be able to describe the ways in which the model relates to a rotating storm.

PREPARATION

Watch these videos on the explanation of hurricanes and how they form:

1. How do hurricanes form?
2. Why Hurricanes are Earth's Most Powerful Storm

Watch this video on how this activity is made:
Hurricane in a Bowl

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:

- 1 Large clear glass bowl
- Water
- 1 spoon/stirring rod
- Food coloring

BACKGROUND INFO

Students should understand that natural hazards have shaped human history. This has had an impact on populations and migrations. They can be local, regional, or global which all can cause a chain impact on each other.
Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that communities can prepare for and respond to these events. A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions, severe weather, floods, coastal erosion).
Humans cannot eliminate natural hazards but can take steps to reduce their impacts. For the activity, teachers should know that in this activity the food coloring will disperse in a spiral formation. Hurricanes are the most dangerous storms on Earth and start over a body of water. A low-pressure and high-pressure wind system mixing will form the cyclone. It becomes a cyclone when the storm reaches 75 miles per hour. The storm is at least 50,000 feet high and around 125 miles across. The eye is around 5 to 30 miles wide.

VOCABULARY

words to know for this experiment

Hurricane: a giant tropical storm that forms over warm ocean waters near the equator and is characterized by powerful winds, heavy rainfall, and a spiraling shape.

Natural Hazard: an extreme event that occurs naturally and causes harm to humans – or to other things that we care about, though usually the focus is on humans

Weather: the state of the atmosphere at a given time, and it can include factors like temperature, wind, pressure, cloud cover, and precipitation. It can also refer to disagreeable atmospheric conditions, like stormy weather

ACTIVITY

1. Fill a large glass bowl about ¾ of the way with water.

2. Stir the water with a spoon/stirrer to create a rotation motion.

3. With the water still rotating, add a few drops of food coloring to the center of the bowl.

4. Watch as the food coloring separates out into a rotation-like pattern.
   a. Also, note how the color spreads and disperses as the rotation of the water slows down and stops.

QUESTIONS

1. Have students describe, either orally or on paper, what they saw. How did the food coloring disperse? How is this similar to how a hurricane or other rotating storm (tornado, cyclone, tropical storm) behaves?
The food coloring disperses in bands that circle around the center of the bowl. It is similar to how a rotating storm behaves because bands of wind, rain, and even debris rotate around the center of a storm, much like the food coloring rotates around the center of the bowl.

2. How is this type of storm created? How does convection relate to hurricanes, storms, and weather in general?
Convection occurs when warm air rises and cool air sinks. Hurricanes form over warm ocean water. Because of convection, the warm moist air near the ocean surface begins to rise. Air from the surrounding areas, pushes in to replace the rising air. That air then becomes warm and also rises, allowing more air to come in and replace it. The constant moving of air creates the spiral movement of the storm.

OCEANITY

Exploring Water, Oceans, and Marine Life

Oceanity

Exploring Water, Oceans, and Marine Life

Water is essential for all life on Earth. It covers about 71% of the Earth's surface and exists in various forms—liquid (oceans, rivers, lakes), solid (ice and snow), and gas (water vapor in the atmosphere). Here are some key points about water:

- Water Cycle: The continuous movement of water on, above, and below the Earth's surface is known as the water cycle. It includes processes like evaporation, condensation, precipitation, and runoff. This cycle is crucial for replenishing water resources and sustaining life.
- Freshwater vs. Saltwater: Only about 3% of the Earth's water is freshwater, found in rivers, lakes, and glaciers. The remaining 97% is saltwater, found in oceans and seas.

Oceans

- Oceans are vast bodies of saltwater that cover about 71% of the Earth's surface. They play a crucial role in regulating the planet's climate, weather patterns, and supporting marine life.
- Currents and Tides: Ocean currents, driven by wind, Earth's rotation, and differences in water density, move water around the globe, influencing climate and weather. Tides are the regular rise and fall of sea levels caused by the gravitational pull of the moon and the sun.

Marine Life

Marine life refers to the plants, animals, and other organisms that live in the ocean. The diversity of life in the ocean is immense, from tiny plankton to the largest creatures on Earth, like the blue whale.

Human Impact and Conservation

Humans rely on oceans for food, transportation, and recreation, but activities like overfishing, pollution, and climate change are threatening marine life and ecosystems. Conservation efforts, such as protecting marine habitats, regulating fishing practices, and reducing plastic pollution, are crucial for preserving the health of our oceans and the diversity of life within them.

Exploring the water, oceans, and marine life opens up a world of wonders and underscores the importance of protecting these vital resources for future generations.

SINKING OR FLOATING FOIL BOATS

A S.T.E.A.M. activity designed to explore boat buoyancy & density

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

OBJECTIVES

The sinking or floating foil boat experiment is a science activity that demonstrates how an object's density and the forces of gravity and buoyancy affect whether it sinks or floats in water.
Buoyancy is a net upward force caused by displacement. A boat displaces a certain amount of water based on its weight and shape. If the weight of the boat is less that the weight of the water it displaces, it floats! If the boat weighs more than the water it displaces, it will sink.

MATERIALS:

EACH STUDENT NEEDS:

- 12" x 12' sheets of foil for each student
- A clear tub of water to test completed boats in
- 500 pennies to use a weight to test each boat
- Towels for clean up and wiping up drips
- A variety of objects to test their sinking and floating capability -(golf ball, small inflatable
- ball, penny, clothes pin, metal ball, volleyball, paperclip, etc).

PREPARATION

Watch this video on how this activity is made:
Sinking or Floating Lab

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.

BACK GROUND INFO:

The science behind floating was first studied by an ancient Greek scientist named Archimedes. He figured out that when an object is placed in water, it pushes enough water out of the way to make room for itself. This is called displacement.

Have you ever experienced displacement? Of course, you have! Remember the last time you got into the bathtub and the water level went up? That's displacement. When you got into the tub, water got out of your way to make room for you, so the water level in the tub got higher.

VOCABULARY

Words to know for this activity:

Buoyancy: the ability of an object to float in water or air. It can also be defined as the tendency of an object to rise or float in a fluid, or the power of a fluid to push an object upward.

Density: a physical property that measures how much mass is packed into a given volume of a substance.

Gravity: an invisible force that pulls objects towards each other

.

When an object enters water, two forces act upon it. There's a downward force (gravity) that's determined by the object's weight. There's also an upward force (buoyancy) determined by the water's weight displaced by the object.

An object will float if the gravitational force is less than the buoyancy force. So, in other words, an object will float if it weighs less than the amount of water it displaces. This explains why a rock will sink while a huge boat will float. The rock is heavy, but it displaces only a little water. It sinks because its weight is greater than the weight of the small amount of water it displaces. A huge boat, on the other hand, will float because, even though it weighs a lot, it displaces a huge amount of water that weighs even more.

ACTIVITY

Each student will be an engineer and will build/design a boat using 1- 12" x 12" sheet of foil. You want your boat to hold the greatest amount of pennies (mass) possible before sinking. (about 10 minutes).

Kids can work individually or with a partner to create their boat.

When the boat is complete, each student/team brings their boat to the "testing station" (tub of water) to be tested. An adult uses pennies to see how much mass each boat will hold.

Important -- Gently add one penny at a time. To prevent the hull from tipping, carefully balance the load as you add pennies (add pennies left to right and front to back — or port to starboard, fore to aft, if you are feeling nautical).

You may want to keep track of each boat's strength on a whiteboard.

Kids can redesign and retest their boat to see if they can make it stronger and hold more mass

optional: Have a second tub of water available for kids to continue experimenting with a variety of items to see if they to sink and float.

QUESTIONS TO ASK

Ask after, during, or before the activity

1. Why did some boats float longer than others?

2. What changes would you make to your boat to make it hold more weight?

3. Why do you think a heavy object like a ship can float, while a small object like a coin sinks?

4. What did you learn about floating and sinking from this experiment?

5. How does the surface area of the boat affect its ability to float?

6. What other materials do you think we could use to build a boat that floats?

WHY SHARKS DON'T SINK

A S.T.E.A.M. activity designed to understand sharks and buoyancy

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

OBJECTIVES

This experiment is a great way to show how sharks float without using a swim bladder like most other fish. A swim bladder is a gas filled organ in bony fish that helps them stay afloat. Some types of sharks use their oil filled liver to stay buoyant.

Oil is lighter than water, so it sits on top of it instead of sinking like the water bottle. The oil in the bottle keeps it buoyant, which is how some sharks such as great whites stay afloat.

MATERIALS:

EACH STUDENT NEEDS:

- Plastic water bottles
- Vegetable oil
- Large plastic tub
- Water
- Optional: plastic toy shark and black permanent markers

PREPARATION

Watch these videos on an explanation of the science behind this experiment:
What Happens When Fish and Sharks Stop Swimming?

Watch this video on how this activity is made:
Why Sharks Don't Sink

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.

HOW ELSE DO SHARKS FLOAT?

Another reason sharks float is because they are made of cartilage rather than bone. Cartilage is, you guessed it, much lighter than bone.

Now let's talk about those shark fins and tail. The side fins are somewhat like wings while the tail fin generates constant movement pushing the shark forward. The fins lift the shark while the tail moves the shark through the water. However, a shark cannot swim backward!

Note: Different species of shark use different means to stay buoyant.

VOCABULARY

Words to know for this experiment:

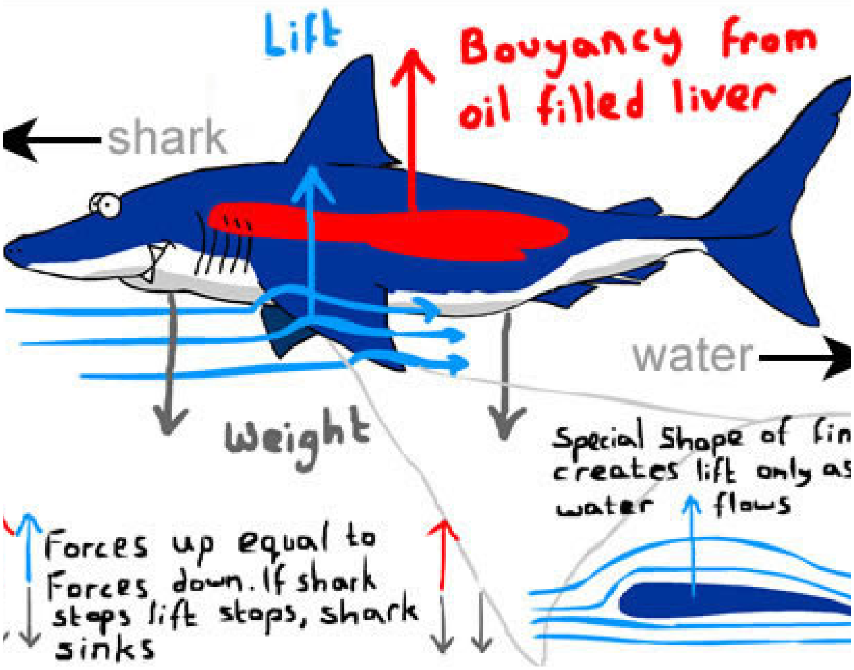
Buoyancy: the ability of an object to float in water or air. It can also be defined as the tendency of an object to rise or float in a fluid, or the power of a fluid to push an object upward.

Swim Bladder: an organ that can fill up or release air, allowing the fish to go up or down in the water. As a fish swims deeper, the pressure on its body increases. The swim bladder helps its body compensate for the pressure changes.

ACTIVITY

1. Take two empty bottles and fill one up with oil, and the other with water. If you are crafty, draw a shark face on each of the bottles to look like two sharks.

2. Put the bottles into the water and observe what happens. The oil bottle should float, while the water bottle sinks.



WHAT TYPE OF SCIENTISTS STUDY SHARKS?

Shark biologists are a type of marine biologist who specialize in studying sharks. They study sharks in the ocean to learn about their biology, including their natural history, physiology, and movement ecology. They also track sharks for data like growth and migration. Shark biologists work to protect and conserve sharks, which are apex predators that help balance the ocean ecosystem by keeping other species in check.

QUESTIONS TO ASK

before, after, or during the experiment:

1. What will the two bottles do once they are in the water?

2. If sharks didn't have their special adaptations, what do you think would happen to them in the ocean?

3. Can you think of any other animals that have special ways to stay afloat?

4. What do you think would happen if a shark didn't have its liver?

5. What did you learn about how sharks are different from other fish?

6. Why is it important for sharks to be able to stay at different depths in the water?

BLUBBER

A S.T.E.A.M. activity designed to explore animal adaptation

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

OBJECTIVES

The ocean can be a cold place, so some animals have adaptations to help them live better in their environment. Some animals, such as whales, have blubber, and this experiment will demonstrate how it keeps them warm in icy conditions.

PREPARATION

Watch these videos on the explanation of animal adaptation and why adaptation is important: Animal Adaptation
Animal Adaptation
Blubber

Watch this video on how this activity is made: Blubber

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:

- Large bowls, enough for 2 students to share one
- Ice
- Cold water
- Ziploc sandwich bags
- Vegetable shortening
- Spatulas
- Towels
- Thermometer

ACTIVITY

1. Start by filling a large bowl with ice and water, each small group needs their own. Take a ziploc bag and turn it inside out, then put your hand inside.
Use a spatula to cover both sides of the bag with vegetable shortening. Place the bag with shortening inside of another bag, and seal if possible.

2. Take another bag, turn it inside out, and place it into another bag, again sealing if possible. Put your other hand into the bag without shortening, and place both hands into the bowl of ice water.

3. Observe how your hands feel, and use a thermometer to check the temperature inside of both bags.

ASK THESE QUESTIONS:

Questions to ask after the lab:

Have a discussion about the temperature differences.

- Why there is a difference?

Other than blubber, what other adaptations do animals have?

- talk about camouflage, venom, behaviors, etc.

PLASTIC BAG FABRIC

Levels: K through 5th
Time: ~30 minutes

ACTIVITY

1. Cut the bottoms and straps off of the bag and set these aside. Smooth them out

MATERIALS:

EACH STUDENT NEEDS:

- 4 plastic grocery bags
- Scissors
- Iron and ironing board
- Two large pieces of PARCHMENT paper
- Towels or heat safe to insulate table top

2. Sandwich the 4 cut bags between two large pieces of PARCHMENT paper – large enough to totally cover the plastic.
You want to protect your iron and your ironing board, so plastic doesn't fuse to them!

3. Set your iron on the "polyester" or "rayon" setting, and iron your bags for about 30 seconds, then flip and iron for 20-30 seconds on the other side. Stop, pull the paper aside, and check for bubbles and loose spots on both sides of your fabric. If you have any spots like this, iron for a few more seconds to fully fuse those areas.

4. Sometimes you may need to peel the bag/material from the parchment as it shrinks and can stick funny. If it begins to look like bacon it has gone too far.

- NEVER let iron metal surface touch the plastic!!! IT WILL MELT

5. To create a pocket or seams, place parchment paper between the layers,

How Does The Lab "Plastic Bag Fabric" Relate To The Ocean

Plastic Pollution in the Ocean

- Plastic Waste: Millions of tons of plastic waste, including plastic bags, end up in the ocean each year. This pollution has devastating effects on marine life, as animals can mistake plastic for food or become entangled in it.
- Microplastics: When plastic bags break down, they often fragment into tiny pieces called microplastics. These microplastics can be ingested by marine organisms, entering the food chain and potentially harming both marine life and human health.

Upcycling and Recycling

- Reducing Waste: The "Plastic Bag Fabric" lab demonstrates how plastic waste can be repurposed into something useful, reducing the amount of plastic that might otherwise end up in the ocean. By turning plastic bags into fabric, students learn about upcycling—a form of recycling that gives waste materials a new life.
- Awareness and Education: Conducting this lab raises awareness about the issue of plastic pollution and encourages students to think critically about their consumption habits and the impact of plastic on the environment. It highlights the importance of recycling and finding creative solutions to reduce waste.

Sustainable Alternatives

- Alternative Materials: The lab can also serve as a springboard for discussions on sustainable alternatives to plastic. It can inspire students to explore other materials that could replace single-use plastics and reduce the overall plastic footprint.
- Ocean Conservation: By learning how to repurpose plastic bags, students can better understand the importance of ocean conservation and the need to protect marine ecosystems from the harmful effects of plastic pollution.

Connection to Ocean Health

- Long-Term Impact: Reducing plastic waste through projects like making plastic bag fabric can contribute to healthier oceans in the long run. Every small action, like upcycling a plastic bag, can help reduce the amount of plastic entering the ocean, benefiting marine life and ecosystems.

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. Why is water important? Can you think of other ways water is important in your life? For life in general?
2. Think about your daily routine. What parts of your routine do you use water?
    a. think about baths/showers, brushing your teeth, your parents making coffee, etc.
3. What other types of scientists study parts of water?
    a. climate conservationists, marine biologists, botanists, etc...

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