South Carolina
STEM
Education Month

DUKE ENERGY SCIENCE NIGHT

Don't Sink the Sub

Big idea

Some objects float, other objects sink. But what's it called when an object does neither?

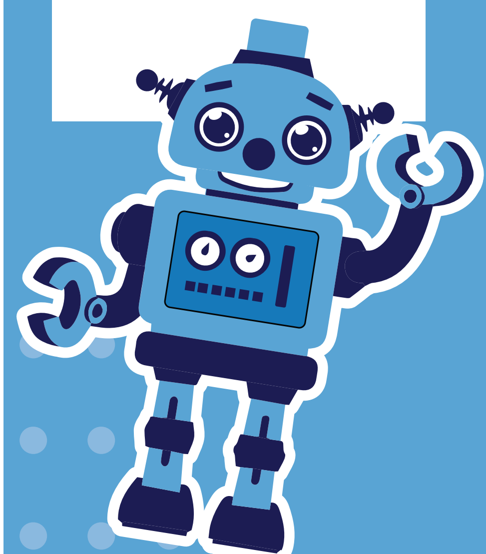
You will need

WHAT WE GAVE YOU:

- corks
- paperclips
- binder clips
- Don't Sink the Sub instruction sheet

STUFF YOU PROVIDE:

- large clear container
- water
- a large towel
- paper towels
- other materials that float or sink (optional)



Set it up

Fill the large clear container no more than 2/3 full of water. Place the towel on a stable surface that won't be jostled or knocked over easily and put the container of water on this. Arrange the Don't Sink the Sub instruction sheet on the table with the corks, paperclips, and binder clips. If you have time, make an example to inspire families and familiarize yourself with the materials.

It's showtime!

Explain to students they'll be using the design process (question, plan, build, test, improve) to experiment with neutral buoyancy. The essential question to ask students is if they can build a vessel that doesn't sink to the bottom of the container and doesn't float at the top of the water, but displays neutral buoyancy and stays in the middle of the water. Give students time to experiment with the materials to determine what floats and what sinks. Then encourage them to put the materials together and go through the testing and improvement steps of the design process. If their vessel is floating, what do they need to add? If their vessel sinks, should they add or remove parts of their vessel?

Once students have created one vessel that displays neutral buoyancy they can build another using different materials. For students that are especially engaged in this activity you can challenge them to build using very limited materials (one cork and only the smaller paperclips) to create a new vessel.

Fun options

AHEAD OF TIME

Provide a second large, clear container of the same size with a saltwater solution inside. Ask students to compare how the same vessel behaves in both fresh and salt water. Objects will be more buoyant in salt water than fresh due to the increased density of salt water.

Create your salt solution by stirring regular table salt 1/4 cup at a time into your water until no more can be dissolved in the water.

Continued ›

SCIENCE FOR ALL • CIENCIA PARA TODOS •

Don't Sink the Sub

Why is this science?

Gravity is a force that pulls everything on Earth downward. Buoyancy is a force that pushes upward on objects that are in fluids (liquids and gases). If an object floats it is positively buoyant, if it sinks it is negatively buoyant, but if it stays somewhere in the middle, neither floating nor sinking, then that object is neutrally buoyant. Objects that are neutrally buoyant, like the vessels you just made, have the same density as the fluid around them. Density is the relationship between an object's volume and its mass. When you tested your creations, you experimented with changing the volume and mass of the vessel, getting hands-on with the concepts of density and buoyancy.

Submarines use the concept of neutral buoyancy. They have special tanks that can be filled with water or air to control the sub's overall density. To submerge, water is allowed into the tanks, increasing the sub's total weight and making it negatively buoyant, causing it to sink. To achieve neutral buoyancy, the sub adjusts the air and water levels in the tank to the point where its density is equal to the density of the surrounding water. This allows the submarine to remain stationary at a specific depth without using its engines. When the sub wants to return to the surface, the tanks are filled with air, decreasing the sub's total weight and making it positively buoyant, which causes it to rise.

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Planning Out and Carrying Out Investigations

Disciplinary Core Ideas: PS1.A: Structure and Properties of Matter – Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. PS2.A: Forces and Motion – Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.

Performance Expectations: 2-PS1-1, 3-PS2-1, 3-PS2-2

Math Extension:

Measurement – Ask students questions about the weight of the various objects. Which is lighter? Which is heavier? How many of a lighter object might it take to equal the same weight as another heavier object? If available, a small scale may be used to provide data for discussion about the weight of the objects.

Estimating (Just for Fun!) – Measure the amount of water that is placed in the large container. Ask students to write down their estimate of the amount of water and their name. Announce a winner at the end of or after the event.

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ADAPTED IN PARTNERSHIP WITH SCCMS

DUKE ENERGY SCIENCE NIGHT

Genetic Trait Bracelet

Big idea

See what genetic traits you have and represent them with a personalized bracelet.

You will need

WHAT WE GAVE YOU:

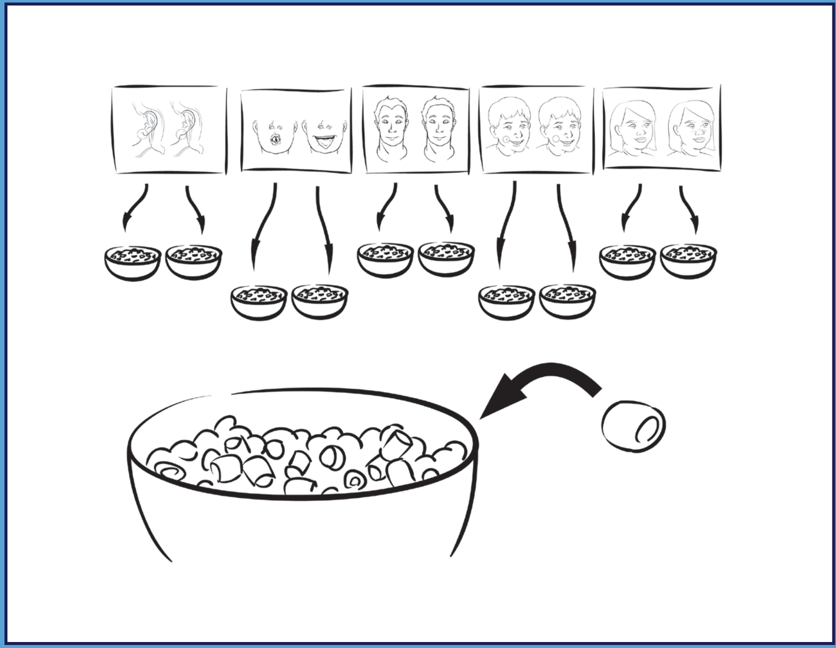
- 10 colors of pony beads
- pipe cleaners
- Genetic Trait Bracelet instruction sheets

STUFF YOU PROVIDE:

- optional: mirror

Set it up

Lay out the trait cards in the order shown in the diagram. Open each container of beads and place the corresponding colors below each of the trait cards. Put the pipe cleaners on the left side of the table. Participants will start at the left and work their way to the right, adding beads to their pipe cleaners as they go.



It's showtime!

As families approach, invite them to learn about genetic traits. These are observable characteristics that are passed down from parent to child. Each person will have many traits they have in common with others, but their overall combination of traits makes them unique.

Ask participants to look at the pictures on each trait card and decide which trait they have, and then add a bead of the corresponding color to their pipe cleaner. They should end up with five beads representing their five traits. Then, they can twist the pipe cleaner around their wrist and wear it as a bracelet.

Encourage students to compare their bracelets with their family members and friends. They may notice that there are usually similarities within biological families.

Continued ›

DUKE ENERGY SCIENCE NIGHT

Genetic Trait Bracelet

Why is this science?

Each of these traits is controlled by **genetics**, meaning that the trait you show on the outside is the result of your genes on the inside. **Genes** play an important role in determining **physical traits** — how we look —and lots of other stuff about us. They carry the information that makes us who we are and what we look like: curly or straight hair, long or short legs, even how we might smile or laugh. Many of these traits are passed from one generation to the next - or inherited - in a family by genes. For example, if your mom has freckles, you might have freckles too because you inherited the trait for freckles.

Genes are so small you can't see them. They are found on tiny spaghetti-like structures called **chromosomes**, which are found inside cells. Each cell in the human body contains about 25,000 to 35,000 genes. **Cells** are the very small units that make up all living things and your body is made of billions of them. A cell is so tiny that you can only see it using a strong microscope. The chromosomes inside the cell come in matching sets of two (or pairs) and there are hundreds — sometimes thousands — of genes in just one chromosome. In humans, a cell contains 23 pairs of chromosomes inside its nucleus. Half of the chromosomes come from one parent and half come from the other parent.

The chromosomes and genes are made of **DNA**. The DNA in a gene spells out specific instructions for making proteins in the cell. Proteins are the building blocks for everything in your body. Bones and teeth, hair and earlobes, muscles and blood, are all made up of proteins. Like chromosomes, genes also come in pairs. Each of your parents has two copies of each of their genes, and each parent passes along just one copy to make up the genes you have. The genes that are passed on to you help to determine many of your traits, such as those in this activity. **Source: https://kidshealth.org/en/kids/what-is-gene.html**

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Constructing Explanations and Designing Solutions.

Disciplinary Core Ideas: LS3.A: Inheritance of Traits – Young animals are very much, but not exactly, like their parents. Plants are also very much, but not exactly, like their parents.

Performance Expectations: 1-LS3-1

Math Extension:

Data - Data can be displayed to generate discussion of fractions. Each trait in this activity has online data to indicate the occurrence of the trait in the U.S. or global population. A poster with circle graphs or other visuals can be created to encourage discussion. *For example, only about 3% of the U.S. population has attached earlobes so that would be a tiny piece of a circle graph and a fraction of 3/100. For comparison, it is estimated that 65-80% of the global population can roll their tongue so that could be represented at 2/3 with a significant portion of a circle graph shaded in.*

Estimating (Just for Fun!) – Place a portion of the beads in a small clear container with a lid and ask students to write down their estimate of the number of beads and their name. Announce a winner at the end of or after the event.

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Geometry Quilt Squares

Big idea

Explore how geometric shapes can be used to make art…and quilts!

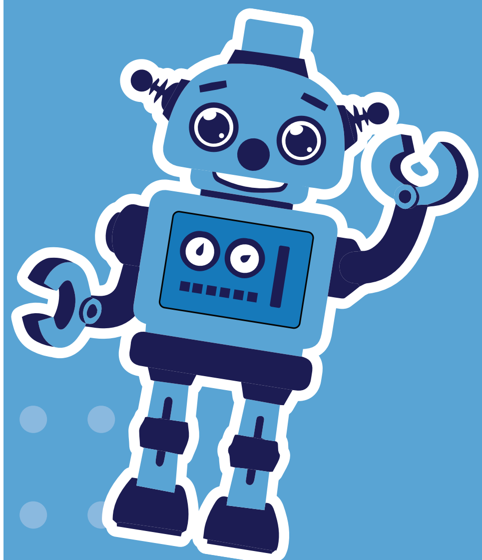
You will need

WHAT WE GAVE YOU:

- graph paper
- colored pencils
- Geometry Quilt Squares instruction sheet

STUFF YOU PROVIDE:

- rulers
- regular pencils with erasers
- additional copies of the instruction sheet (optional)



Set it up

Ahead of time, collect the materials that you will provide. Depending on how many participants you expect, you may want to make additional copies of the instruction sheet. On the night of the event, place the supplies and the instruction sheet(s) on a table or two.

It's showtime!

As families approach your station, ask them if they knew that quilts were full of geometry? Then have them examine the example quilt squares. Ask them: What types of lines and angles do they see? What shapes can they identify? Do they see any lines of symmetry? Can they divide the pattern into fractional parts, such as in halves or in quarters?

Invite them to use this knowledge and the materials provided to create their own Geometry Quilt Square. When they have finished, invite them to discuss the geometry that is represented in their square.

Fun options

AHEAD OF TIME

Have a space where students can tape their quilt squares next to each other to form a community quilt. (Make sure each quilt square has a name included so that it can be returned to the student that created it.)

Display a quilt (or a picture of a quilt) so that students can see how individual quilt squares are stitched together to make the final product.

Continued ›

DUKE ENERGY SCIENCE NIGHT

Geometery Quilt Squares

Why is this science?

This is geometry - an important branch of mathematics. Students begin their study of geometry at an early age; learning to identify shapes and their various attributes, composing larger shapes from simple shapes, partitioning shapes into portions such as halves or quarters, and recognizing lines of symmetry.

The name geometry originates from the Greek words for “earth” and “measure”. It is one of the oldest branches of mathematics with principles that were developed to meet practical needs such as land measurement and construction. Architects and designers continue to use geometry to create and construct stable and beautiful structures.

Geometry also helps to describe and model the physical world. The shapes and patterns found in plants, animals, and landscapes are all examples of geometric principles at work. For example, the circles visible in ripples of water, the spherical shape of a water drop, the hexagonal shape of cells in a beehive, and the spirals found in seashells and pinecones.

Mathematical principles such as perspective, proportion, and composition help artists create realistic images on a flat surface. Geometric shapes, patterns and symmetry have also long been used in the creation of art. Just like in the Geometry Quilt Squares made today.

SC College and Career Ready Standards for Mathematics 2025

Strands: Measurement, Geometry, and Spatial Reasoning; Numerical Reasoning.

Standards: K.MGSR.2.1: Identify and describe the attributes of triangles, squares, rectangles, circles, cubes, and spheres to include everyday situations. K.MGSR.2.2: Describe relative positions of objects by appropriately using terms including below, above, beside, between, inside, outside, in front of, or behind. 2.NR.4.1: Partition in multiple ways squares, rectangles, and circles into two or four equal sized parts, and describe the parts using words halves, fourths, a half of, and a fourth of. 2.NR.4.2: Explain that when partitioning a square, rectangle, or circle into two or four equal parts, the parts become smaller as the number of parts increases. 3.NR.2.1: Identify unit fractions as the quantity formed by one part when a whole is partitioned into 2,3,4,6, or 8 equal-sized parts. Express each part as a unit fraction of the whole. 3.NR.2.2: Represent fractions from 0 to 1 using concrete, set, area, and linear models, and write them in standard form and word form. 3.NR.2.3: Express whole numbers as fractions and identify fractions that are equivalent to whole numbers.

Cross-curricular Connections:

In addition to mathematical concepts, this activity can be connected to the Design and Visual Arts standards as well as the Social Studies standards. Design and Visual Arts connections include using the “elements and principles of art to create artwork” (SC VA.CR anchor standard 1) and “conceiving and developing a design challenge” (SC De.CR anchor standard 1). Social Studies connections may include having images of quilts from different time periods, cultures and /or geographic locations to spark interest.

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DUKE ENERGY SCIENCE NIGHT

I Spy with my Microscope Eye

Big idea

Microscopes help us to see more than we can with our eyes alone.

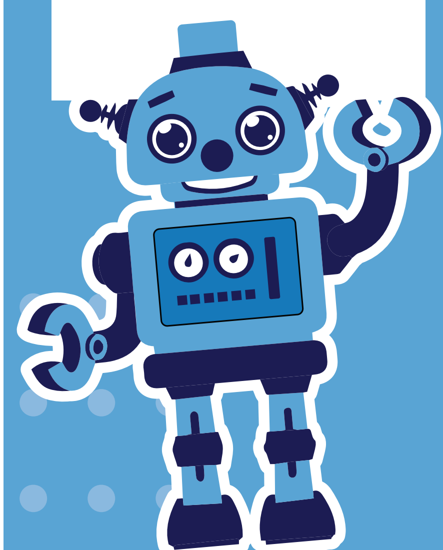
You will need

WHAT WE GAVE YOU:

- Digital Microscope
- I Spy with my Microscope Eye instruction sheet

STUFF YOU PROVIDE:

- a computer with a USB type interface
- objects to view - For example: paper, fabric, a coin, dollar, leaf, flower, seashell, anything you find interesting!



Set it up

Plug the Digital Microscope into the USB port on the computer and open the Camera (PC) or Photo Booth (Mac) application. The scope can be used when held in your hand or clipped into the stand. If using the stand, it is a good idea to tape it to the table. The buttons on the scope will not work with most computers. You can use the application to take pictures of images, if desired.

Remove the plastic cap from the end of the plastic tip. Take care to ensure objects (including fingers) do not come into contact with the microscope lens. The clear plastic tip is designed to help protect it.

Place the objects to view and the I Spy with my Microscope Eye instruction sheet next to the microscope.

It is important to review the instruction sheet and practice using the microscope so that you feel comfortable assisting participants.

It's showtime!

As families come up, ask them if they have ever seen or used a microscope before. Ask them, "what does a microscope do?" Explain that a microscope is a tool that magnifies things - makes them look bigger - so we can see tiny details that are too small to notice with our naked eyes.

This microscope may look a little different than one they have seen before. This is a digital microscope that connects to a computer, so we look at the magnified image on the computer screen instead of through an eyepiece.

Demonstrate how to use the scope, then let participants try it themselves. In addition to the gathered objects, encourage them to look at their skin, fingerprint, fingernail, hair, and clothing.

Fun options

Print photos of magnified objects to have on the table. Participants can look at them and guess what each object is while they are waiting to use the microscope.

Continued ›

SCIENCE FOR ALL • CIENCIA PARA TODOS •

DUKE ENERGY SCIENCE NIGHT

I Spy with my Microscope Eye

Why is this science?

A microscope allows you to look more closely at a specimen and see more than you could with your eyes alone. This microscope works by shining light onto an object. The light is reflected off the surface of the object and captured by the camera lens inside the scope to produce an enlarged digital image. The magnification level is determined by the distance of the object and the focus point set by the big silver focus wheel. This microscope can enlarge the image of a grain of salt (which is only approximately 0.3 millimeters) between 40 to 1000 times it's size, allowing you to see it much better!

With this microscope you are able to zoom in on the outside of objects. Stronger microscopes can magnify even more and be used to get an inside, closer look - making it possible to view cells and even atoms! There are multiple kinds of microscopes that can be used for all sorts of things!

Microscopes help many types of scientists. For example: doctors use microscopes to see bacteria, viruses, and other germs so they can figure out what is making their patient sick; forensic scientists use microscopes to get a closer look at evidence from a crime scene; and engineers use microscopes to help them build the tiny microchips that go inside computers.

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Planning and Carrying Out Investigations

Disciplinary Core Ideas: PS1.A: Structure and Properties of Matter – Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.

Performance Expectations: 2-PS1-1

Math Extension:

As students view the magnified object on the screen, discussion might include these topics:

• Geometry – What shapes or patterns do you see in the magnified image that you did not see before?

• Measurement, Numerical Reasoning – How many times larger is the magnified image than the actual object?

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Light the Way

Big idea

Explore how light travels while playing laser tag with Tinker!

You will need

WHAT WE GAVE YOU:

- laser pointers*
- mirrors
- wood blocks
- 5x7-inch cardboard
- 5-inch easel backs
- double-sided tape
- Tinker cut out cards (in the binder)
- Light the Way instructions

STUFF YOU PROVIDE:

- Masking Tape
- An area of a room that is not too bright
- Optional: A large cardboard box to contain the activity and facilitate seeing the laser light better

* Refer to Important Safety Notes on back

Set it up

Prior to the event:

- Create two 3'x3' workstations with masking tape, either on the table or on the floor. Each workstation will contain 1 laser pointer, 2 mirrors/ blocks, 2 cardboard easels, and 1 Tinker card.
- Cut each 5"x7" cardboard in half to make two pieces that are 3.5"x5". Attach one 5" easel to each cardboard.
- Use the double-sided tape to attach the mirrors to the wood blocks so that the bottom of the mirror is flush with the bottom of the block.
- Prepare the Tinker cards by cutting on the dotted lines and folding on the solid lines so they will stand upright on the surface.
- Install the batteries in the laser pointers and make sure they light up.
- Secure the laser pointers to the workstations with masking tape, taking care to ensure the on/off buttons are not covered.

It's a good idea to set up a sample maze before the event begins, like the example shown on the instruction sheet. This way, you will become familiar with the process and your sample will serve as an example for others participating in this activity.

It's showtime!

As families approach, invite them to play laser tag with Tinker...but, let them know that they cannot simply shine the laser light directly on Tinker- that's too easy! Ask participants what happens when a light hits a mirror. The answer is that the light will bounce or reflect. Then they will explore this as they use the mirrors to direct the light to Tinker.

Suggest they start by using one mirror and stand-up Tinker card to see how light is reflected when it hits the mirror at an angle. Let them explore the angle of reflection by moving the Tinker card so that the light hits it. Then have them place a cardboard easel in the path between the mirror and Tinker to learn that cardboard absorbs light and does not reflect it.

Next, challenge them to add a second mirror to catch the light reflected from the first mirror and reflect it onto Tinker. As a final challenge, partially block Tinker with a cardboard easel to see if they can move the mirrors in order to allow the light to find a path to Tinker.

Continued ›

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Light the Way

Important safety notes

- The laser pointer should remain taped to the workstation surface.
- Do not deliberately look or stare into the laser beam.

A laser pointer is a Class 3A laser and is low-powered. It normally would not harm eyes during a momentary exposure. Laser protective eyewear is therefore normally not necessary. A Class 3A laser is not a skin or materials burn hazard.

Why is this science?

While playing tag with Tinker, you were exploring physics and energy. Your laser pointer is an energy source that produces a straight beam of light. When the light beam hits the cardboard, most of the light is absorbed into the material while some of it is scattered into the air. However, when it hits the shiny surface of the mirror, most of the light is reflected and travels in a new direction that we can observe. To reach Tinker, the light has to be reflected at certain angles that we can control with the mirrors. If we reflect the laser beam multiple times, you may notice that it appears to grow dimmer as the mirrors absorb a fraction of the light as well.

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Planning and Carrying Out Investigations

Disciplinary Core Ideas: PS4.B: Electromagnetic Radiation – Light travels from place to place. Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. PS3.A: Definitions of Energy – Energy can be moved [transferred] from place to place by moving objects or through sounds, light, or electric currents. PS3.B: Conservation of Energy and Energy Transfer – Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. Light also transfers energy from place to place. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce, motion, sound, heat, or light.

Performance Expectations: 1-PS4-3, 4-PS3-2

Math Extension:

Measurement – Add measurements to the "workstation" that you tape off by writing them on the tape. Ex: 1 yard = 3 feet = 36 inches. This visual will reinforces measurement concepts and can lead to discussion about the area of the marked off space for some students.

Geometry – Use vocabulary related to angles (acute, obtuse, right) to encourage students to discuss the angles they see and to try various arrangements of the mirrors to change the angle of reflection.

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Paper Circuit Robot

Big idea

Learn how to use aluminum foil to complete a circuit that transfers energy from a battery to an LED, lighting up our robot's antenna in the process!

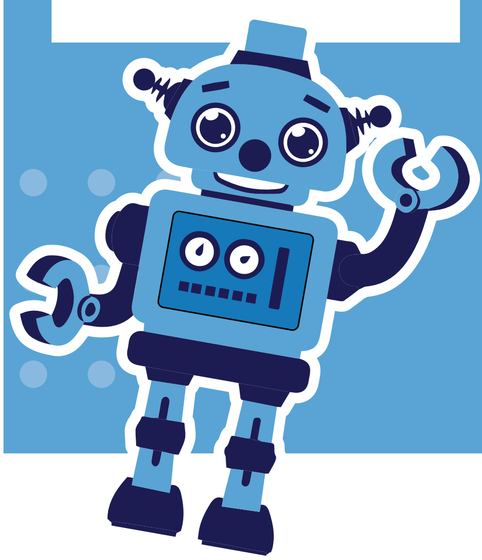
You will need

WHAT WE GAVE YOU:

- paper circuit robot templates (4 per sheet)
- aluminum foil sheets
- LED lightbulbs
- CR2032 Lithium button batteries
- clear tape
- Paper Circuit Robot instruction sheet

STUFF YOU PROVIDE:

- pencils
- additional batteries (optional)



Set it up

Cut the template sheets in quarters. Cut the aluminum foil into strips that are approx. ½-in wide and 5-in long. You may also want to prepare 1-in long pieces of tape. Lay out all materials on the table(s). You could create multiple building stations or try an assembly line. Using the instruction sheet, make your own paper circuit robot to use as an example and to be sure you understand the instructions as well as anticipate any issues children may face.

It's showtime!

Show families how your paper circuit robot works by touching the horizontal aluminum foil strip onto the positive (+) side of the circuit and on the top (+) side of the battery. This creates a closed circuit which allows the electricity to flow and the LED light bulb to convert electrical energy into light energy. Lifting the foil out of contact with the battery will break (or open) the circuit so the LED is no longer lit.

Help families create their own paper circuit according to the instruction sheet and invite them to borrow one of the batteries to test it when they are ready.

Younger children will likely need help with this activity. Be sure that the LED leads, foil strips, and battery are oriented exactly as shown in the instructions. It is important that the short lead is in contact with the negative (-) side of the battery and the long lead is in contact with the positive (+) side of the battery. There can be no breaks in the connections along the circuit for the transfer of electrical energy to work properly. Be sure that the foil is wrapped tightly around the leads. Aluminum foil is a conductor of electricity, but tape is an insulator and will stop the energy flow if it is accidently placed on the circuit.

Continued ›

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DUKE ENERGY SCIENCE NIGHT

Paper Circuit Robot

Why is this science?

In this activity, you used a battery, aluminum foil, and a LED light bulb to complete a circuit that transfers electrical energy into light energy. The battery is the source of the energy. A conductor is a material that allows electricity to flow through it. Aluminum foil is a good conductor and allows the electrical current to flow through it from the positive to the negative side of the battery. Light bulbs convert electrical energy into light energy. The robot's antenna lit up when you created a closed circuit - a complete path for electricity to flow.

The word "circuit" comes from the word "circle." Electricity needs to have a closed circuit to work. If there is a gap, the circuit is open, and the electricity can't flow. When you lift the aluminum foil from the battery you open the circuit, and the LED is not lit up. Some materials are insulators which do not allow energy to flow through it. Tape is an insulator. If the tape is not properly placed in our circuit the flow of electricity will stop, preventing the LED from lighting up.

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Asking Questions and Defining Problems; Planning and Carrying Out Investigations; Constructing Explanations and Designing Solutions

Disciplinary Core Ideas: PS2.B: Types of Interactions – Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. PS3.A: Definitions of Energy – Energy can be moved [transferred] from place to place by moving objects or through sounds, light, or electric currents. PS3.B: Conservation of Energy and Energy Transfer – Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. PS3.D: Energy in Chemical Processes and Everyday Life – The expression "produce energy' typically refers to the conversion of stored energy into a desired form for practical use.

Performance Expectations: 3-PS2-3, 4-PS3-2, 4PS3-4

Math Extension:

Geometry – Reinforce vocabulary as students are placing the strips of foil on the back of the paper by including conversation about the parallel and perpendicular relationship of the strips.

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Parachutes

Big idea

Explore properties of gravity and drag by designing and building a parachute with a few simple household materials.

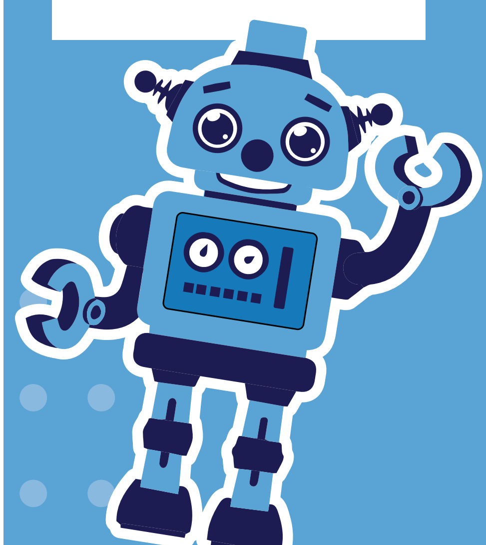
You will need

WHAT WE GAVE YOU:

- napkins
- paper clips
- string
- masking tape
- Parachutes instruction sheet

STUFF YOU PROVIDE:

- scissors
- markers and small sticky notes (optional)



Set it up

Use masking tape to create a bullseye target on the floor. Start with the center ring about the size of a paper plate and move outward in concentric rings. Make each new ring a foot or so larger than the previous. The target should consist of 3 or 4 rings. You may choose to provide additional targets depending on space available.

Lay out the materials in order from left to right: string, scissors, napkins, masking tape, paper clips. Place the Parachutes instruction sheet on the table. It’s a good idea to make your own parachute beforehand. This way the students can see the finished product, and you get a chance to make sure you understand the instructions as well as anticipate any issues children may face when constructing and testing their parachutes.

It’s showtime!

Show families how your example parachute works. Help families make a parachute according to the instructions. Challenge them to drop it so that their passenger, a paper clip, lands as close to the center of the target as possible. If you'd like to track where parachutes land, have each participant put their name or initials on a small sticky note – each time they drop their parachute they can place the sticky note where their paper clip landed. Encourage them to explore different variables when testing and building their parachutes. For example: the height from which it is dropped, where they are standing when they drop their parachute, the angle at which it is released, the length of the strings, etc.

If they love it?

After participants have successfully built one parachute, challenge them to change the design (one element at a time!) to see how it impacts the descent of their parachute.

Continued ›

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Parachutes

Fun options

AHEAD OF TIME

If you want, you can provide additional materials like coffee filters, newspaper, tissue paper, etc. Small plastic animals make fun parachute passengers while providing a little extra challenge to the parachute design.

DURING SCIENCE NIGHT

If you have an additional volunteer, you can add a ladder to the activity to make the parachute launches more dramatic. The volunteer can "spot" children while on the ladder to ensure safety.

Why is this science?

When you throw something into the air, like your parachute, it falls because the force of **gravity** pulls it to the ground. As something falls or moves through the air it experiences another force called **drag**, which is caused by the air pushing back against that object. Have you ever put your hand outside a car window as it was moving? The air rushing past the car pushes your hand backwards. Drag slows the object down and the more drag, the slower the object will move. As a parachute falls, the part that fills with air is called the canopy. A parachute works because air gets trapped in the canopy, increasing the force of drag on the parachute and slowing its descent to the earth. Successful parachutes will increase drag enough to allow the object to land safely.

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Engaging in Argument from Evidence

Disciplinary Core Ideas: PS2.B: Types of Interactions – The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.

Performance Expectations: 5-PS2-1

Math Extension

Data – Students can collect data (time of the drop, weight added or removed, height dropped from) for 3 trials of their parachute or for 3 trials of 3 different parachutes if others are at the station together. A small whiteboard to informally and quickly record the data would be helpful. The data can then be compared and discussed. Which was faster / slower and why? How did the weight affect the time?

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Pinwheel Power

Big idea

Learn how to harness wind energy by making a pinwheel.

You will need

WHAT WE GAVE YOU:

- pinwheel templates
- pencils with erasers
- push pins
- Pinwheel Power instruction sheet

STUFF YOU PROVIDE:

- scissors
- electric fan (recommended)

Fun options

AHEAD OF TIME:

Provide markers and other art supplies for children to use to decorate their pinwheels.

DURING SCIENCE NIGHT:

If an electric fan is available, participants can hold their pinwheel in front of the fan and watch the pinwheel whirl!

Set it up

Place a Pinwheel Power instruction sheet on the table along with pinwheel templates, pencils, push pins, and scissors. Plug in the electric fan.

It's showtime!

As families approach, ask, "Do you want to make a machine that captures the energy of the wind?" Ask if they know what a pinwheel is. Explain that a pinwheel is a lot like a windmill or wind turbine, because it can change wind energy into mechanical energy. Mechanical energy makes the pinwheel spin!

Give each student a pinwheel template, a pencil, a push pin, and scissors. (If the student is very young, ask an adult family member to be in charge of the push pin.) The student will need to cut out one square template and then cut along the four dotted lines.

Have the student bring the four corners marked with an X to the center of the template. The tips of the corners should then overlap each other. Advise the student not to fold the paper—but instead make a loop, so it can catch air.

Guide the student or adult family member as they push the pin through the center of the pinwheel, being sure the pin also goes through the tips of the four corners to hold them in place.

The pencil will be the pinwheel's handle. Have the student or adult push the pin into the side of the pencil eraser.

Invite the student to hold out the pinwheel so the front of the pinwheel is at a right angle to their body. They will need some space so they can swing their arm from side to side, pushing the pinwheel through the air to make the blades spin.

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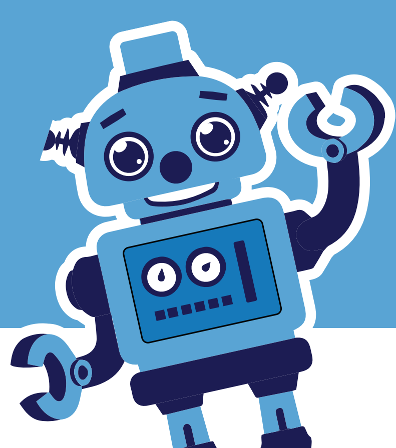

SCIENCE FOR ALL • CIENCIA PARA TODOS •

DUKE ENERGY SCIENCE NIGHT

Pinwheel Power

Why is this science?

Wind is a source of kinetic energy, the energy of motion. We see the effect of wind energy when a gust blows an umbrella inside out. We hear the effect of wind energy when leaves rustle on trees. We experience the effect of wind energy when we feel a cool breeze against our skin.

Your pinwheel is a machine that converts wind energy into mechanical energy, the ability to do work, and makes the blades turn. The same concept is used in windmills. For centuries, windmills have helped people around the world with tasks like pumping water and turning grain into flour.

Though wind turbines are more complicated than pinwheels, they also use rotating blades to capture wind energy. Wind turbines convert wind energy into mechanical energy—and then convert that mechanical energy into electrical energy. Electrical energy created from wind energy, a renewable resource, can be used in homes and communities. Wind energy supplied more than 8% of total U.S. electricity generation in 2020.

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Constructing Explanations and Designing Solutions

Disciplinary Core Ideas: ESS3.C: Human Impacts on Earth's Systems – Things that people do to live can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World – Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. Thus, developing and using technology has impacts on the natural world. PS3.B: Conservation of Energy and Energy Transfer – Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

Performance Expectations: 2-ESS3-1, 4-PS3-4

Math Extension

Geometry – As the students begin to cut the square, engage them in discussion about the shape and its attributes. What shape is this? What makes it a square? What would be the measure of the smaller angles made when the right angle is cut in half? If the lines were cut all the way through, what shapes would be formed?

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Reading Trees

Big idea

Gather around and read the story of a tree! Count the annual rings to see how old it is, learn about changes in the environment where it was growing and when it had slow growing year, or a giant growth spurt – just like people!

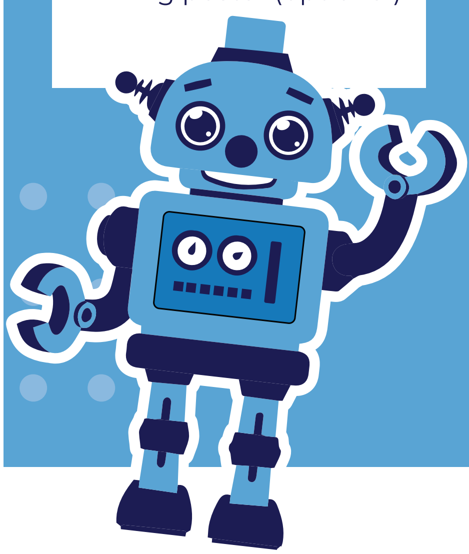
You will need

WHAT WE GAVE YOU:

- Tree Ring poster
- tree rounds
- hand lenses
- paper plates
- markers
- Reading Trees instruction sheet

STUFF YOU PROVIDE:

- easel to display Tree Ring poster (optional)



Set it up

Lay out the tree rounds and hand lenses on the table - spaced out to allow multiple participants to join. Place the Tree Ring poster either in the middle of the table, or on an easel so everyone can see it. Place the markers and plates on the table so they are available for participants to use after they investigate the tree rounds.

Make an example Tree Round of your own timeline, showing how many annual rings you would have, any major events like a moving to a new house or city, any broken bones, new siblings, etc.

It's showtime!

Reading Tree Rounds: These cross sections of trees allow you to tell the age of the tree. Each ring has two parts: the lighter (and often wider) part is the spring growth, and the darker (usually much thinner) part is later summer/fall growth. To count the rings, only count the light **or** only count the dark part but not both. Use the Tree Ring poster as a guide so the group can all see. There are also different marks on tree cookies that can explain events in tree's life such as scars from a fire or narrow growth rings from insect infestations or drought.

Ask participants to examine the different tree rounds at the table and discuss their observations – age, events, how much it has or has not grown, etc.

Next, invite them to make a tree round of their own life. Instructions are included for students to enable them to make their timeline unique to their own experiences.

Encourage participants to compare their annual rings to others (adults and children). Even though all the plates are the same size, they will all have different numbers of rings. Trees are similar in that they may be the same size but different ages, or different sizes and the same age! This is because some tree species grow faster than others, and some trees grow at a different rate depending upon where they grow (on a mountain top, in a valley, etc.).

Continued ›

SCIENCE FOR ALL • CIENCIA PARA TODOS •

Reading Trees

Why is this science?

Scientists use very old trees to learn about past climates using a science called **dendrochronology** – the study of tree time. To look at a tree's annual rings without cutting it down or harming it, foresters and forest scientists use a tool called an **increment borer**. This makes a long narrow cylinder of wood called a core sample, and the rings appear as lines. Dendrochronology is used not just by climate scientists and tree scientists (dendrologists), but by archeologists to date materials and artifacts made of wood and by chemists to calibrate radiocarbon dates, i.e. carbon dating!

Check out this link for more information:
www.environmentalscience.org/dendrochronology-tree-rings-tell-us

If they love it

Recommend the book "In a Nutshell" by Joseph Anthony. This story follows an acorn that falls from an oak, sprouts and grows, and sees many changes in the forest during its lifetime.

This activity produced in partnership with:

The North Carolina Arboretum

SC College and Career Ready Science Standards 2021

Science and Engineering Practice: Constructing Explanations and Designing Solutions; Engaging in Argument from Evidence

Disciplinary Core Ideas: LS3.A: Inheritance of Traits – Some characteristics result from individuals' interactions with the environment which can range from diet to learning. Many characteristics involve both inheritance and environment. LS3.B: Variation of Traits – The environment affects the traits that an organism develops. LS4.C: Adaptation – Adaptation can lead to organisms that are better suited for their environment. For any particular environment, some kids of organisms survive well, some survive less well, and some cannot survive at all. LS2.C: Ecosystem Dynamics, Functioning, and Resilience – When the environment changes in ways that affects a place's physical characteristics, temperature, or availability of resource, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environments, and some die. LS4.D: Biodiversity and Humans – Populations live in a variety of habitats and change in those habitats affects the organisms living there.

Performance Expectations: 3-LS3-2, 3-LS4-3, 3-LS4-4

Math Extension

Numerical Reasoning – As students study the tree ring samples and begin to think about creating their own tree ring drawing to represent their life, ask them questions to compare the related values. How does the age of the sample tree compare to your age? How much older or younger is the tree than you?

Measurement – Provide rulers to allow students to measure and compare the distance between some of the rings on the tree sample and make connections to what those measurements might imply about the tree's annual growth conditions.

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Rubberband Guitars

Big idea

Explore how sounds are made by building a noisemaker.

You will need

WHAT WE GAVE YOU:

- cups
- rubber bands in different thicknesses
- Rubberband Guitar instruction sheet

Set it up

Set out the cups, rubber bands, and Rubberband Guitar instruction sheet on your table. You may want to sort the rubber bands into a “thinner” and a “thicker” pile. It’s a good idea to make your own Rubberband Guitar as an example. This way the students can see the finished product, and you get a chance to make sure you understand the instructions as well as anticipate any issues children may have assembling their own Rubberband Guitars.

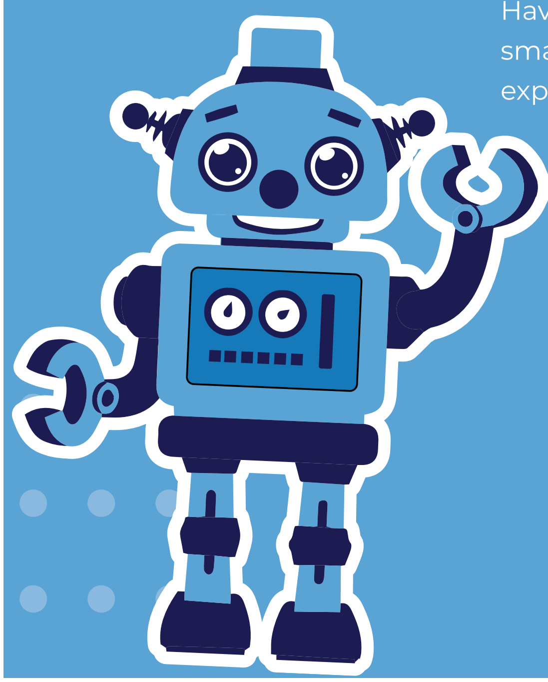
It’s showtime!

Help students build their Rubberband Guitars according to the instructions. Younger children may have difficulty stretching the rubber bands around the cup. Encourage family to help with this part. Once they are built, encourage them to experiment by plucking and strumming their Rubberband Guitars. Ask them to consider whether the rubber bands make the same sound. Which sounds higher and which sounds lower? Why?

Fun options

AHEAD OF TIME

Have some stringed musical instruments (some large and some small) on hand so that participants can view them or even experiment with their sounds.



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SCIENCE FOR ALL • CIENCIA PARA TODOS •

Rubberband Guitars

Why is this science?

In order to understand how musical instruments create sound, you need to know a little bit about the physics of sound waves. Sound is the vibration, or back-and-forth movement, of air particles. We hear sound when those vibrations hit our eardrums. All sound is created by vibration, but not all vibrations are made in the same way. You can make vibrations by hitting something (like a drum, or stomping your foot), by plucking something (like a guitar string), or by using your breath to make vibrations in a column of air (like playing the flute or a horn).

In the Rubberband Guitar, what's vibrating? The rubber bands stretched across the cup opening. When you pluck or strum them, each rubber band vibrates. The movement of the rubber band makes the air move, and that movement of air is what we hear as sound.

Sound can have pitch, meaning how high or low it sounds. Plucking the thinner rubber band makes the pitch higher because it is vibrating faster and moving the air more quickly. Plucking the thicker rubber band makes the pitch lower because it is vibrating slower and moving the air more slowly. Think about big instruments versus small ones: the double bass makes much lower sounds than the violin and the tuba is much deeper than the trumpet. A longer vibration makes a lower sound.

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Science and Engineering Practice: Planning and carrying out investigations

Disciplinary Core Ideas: PS3.A: Definition of energy – Energy can be moved [transferred] from place to place by moving objects or through sound, light, or electric currents. PS4.A: Wave properties – Sounds can make matter vibrate and vibrating matter can make sound.

Performance Expectations: 1-PS4-1, 4:PS3-2

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