South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Build-a-Bubble

Big idea

Explore the properties of soapy water and geometry by blowing bubbles!

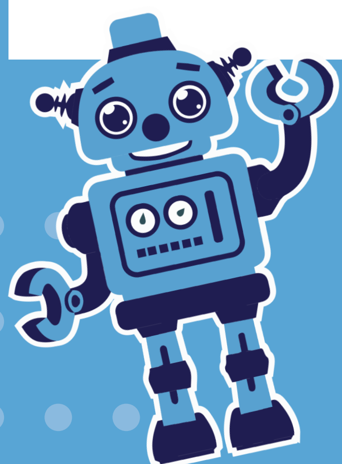
You will need

WHAT WE GAVE YOU:

- Dawn dish soap
- pie tins
- pipe cleaners
- Bubble Challenges instruction sheet

STUFF YOU PROVIDE:

- water
- large mixing container
- paper towels
- optional: additional supplies for creating bubble wands (straws, string, plastic rings, etc.)



Set it up

Mix Dawn dish soap and water together in a large container, like a bucket or mixing bowl, to create a bubble solution. There's no magic formula; a lot depends on humidity and temperature. If the water in your area is very hard, you may have better results with purchasing distilled water. A basic ratio to start with is 1 part Dawn to 4 parts water. Measure the water first and then slowly stir soap into the water.

Pour some bubble solution into the pie tins (about ½ full) and save the rest in your mixing container – you'll probably need to refill the tins throughout the event.

Set out pipe cleaners, any other bubble makers, and Bubble Challenge instruction sheet.

It's a good idea to have paper towels on hand for this activity.

It's showtime!

Show students that they can blow bubbles with their hands as long as their hands are wet. They simply need to dip one or both of their hands into the bubble solution, then form a circle with their fingers and blow through it. Then, give them a pipe cleaner and ask them to construct a bubble wand. Show them the challenge sheet and see what kind of bubbles they can create.

Fun options

String can be used to make wands that will create larger bubbles. Start with two straws. Cut a piece of string (about 2 feet long) and thread it through both straws. Then, tie the ends of the string together. Dip everything into the bubble solution. Using the straws as handles, pull the two straws apart from each other, forming a rectangle frame. Carefully pull the frame out of the bubble solution and gently wave it through the air. As you pull it through the air slowly flip the frame up or down to release the bubble. This will take a little practice.

Continued ›

SCIENCE FOR ALL • CIENCIA PARA TODOS •

Build-a-Bubble

Why is this science?

From physics to geometry, color to chemistry, bubbles are full of science! Bubbles are made of a very thin film of soap and water with a gas inside. The bubbles we're blowing are full of air, but they can be made with any kind of gas. You can picture a bubble like a balloon – it's a thin, stretchy skin surrounding a pocket of gas.

A single bubble that's not touching any other bubbles will always be round, because a sphere (or ball shape) contains the most gas (air) using the least amount of surface area (soap film). But once a bubble touches other bubbles, it changes shape, because they form a common wall where they touch. Bubbles touching each other create angles of 120 degrees, no matter how big the bubbles are or how many there are. Think about a beehive: the beeswax is arranged in hexagons, with angles of 120 degrees. Just like the beehive, bubbles arrange themselves in a hexagonal pattern that conserves surface area.

SC College- and Career-Ready Science Standards 2021

Science & Engineering Practice: Developing and Using Models - Develop a model to describe phenomena.

Disciplinary Core Idea: PS1.A: Structure and Properties of Matter - Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space (and can be detected by their impact on other objects) can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. **Performance Expectation:** 5-PS1-1

Math Connection

Challenge participants to create bubble wands using different shapes and predict which shape will create the largest or smallest bubbles. Participants can also measure the perimeter of the wand shapes they make, discuss the symmetry of the shapes, count number of sides of the shapes, and compare shapes based on their geometric properties.

Key Concept: Geometry, Measurement and Data Analysis

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Build a Cell

Big idea

Get familiar with the basic parts of a cell by making a simple model.

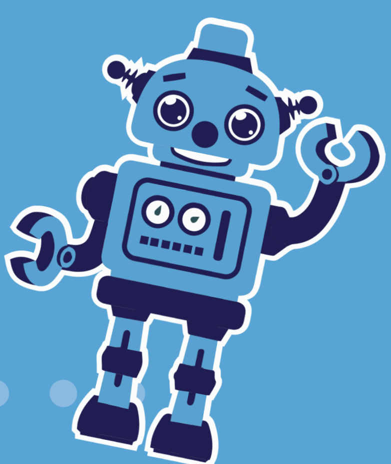
You will need

WHAT WE GAVE YOU:

- pipe cleaners
- plastic capsules
- plastic bags
- Build a Cell instruction sheet

STUFF YOU PROVIDE:

- permanent markers
- pencils
- scissors



Set it up

If you are using 12-inch pipe cleaners, cut each of them in half prior to the event. Place the Build a Cell instruction sheet on the table next to the 6-inch pipe cleaners, plastic capsules, and plastic bags.

It's showtime!

As families approach, invite them to make a simple model of a cell. Remind them that cells are the basic building blocks of all living things and that there are 50 trillion cells in their bodies! Explain that each cell is made up of three basic parts:

- the cell membrane is the outer lining of the cell and will be represented by the plastic bag.
- the nucleus is like the "brain" or "boss" of the cell because it has all the instructions for the cell to do its job. It will be represented by the plastic capsule
- the cell's instructions are located in DNA which is found in genes that are linked together in structures called chromosomes. This is the genetic material for a cell and will be represented by the pipe cleaners. Chromosomes come in pairs - one from the biological mother and one from the biological father.

Give each student one plastic bag, one plastic capsule, and six 6-inch pipe cleaners to make their cell model. Have them use a permanent marker to write "cell membrane" on the plastic bag and "nucleus" on the plastic capsule.

Remind them that chromosomes come in pairs, so they should work with their pipe cleaners in pairs. They will notice that the pipe cleaners are longer than the capsules. Point out that in the cells in their body, the genetic material is in a special shape or form to fit into the nucleus - a spiral shape called a helix. The students will need to twist their pairs of pipe cleaners into spirals and press them down so that they fit into the nucleus. (This can be done by twisting the pipe cleaners around a pencil or a finger.)

Continued ›

SCIENCE FOR ALL • CIENCIA PARA TODOS •

Build a Cell

Why is this science?

Cells are the basic building blocks of all living things. We're all made up of cells: we have about 50 trillion cells in our bodies, and each has over 20,000 genes inside! A cell is so tiny that you can only see it by using a strong microscope. Each cell is made up of three basic parts:

- The cell membrane is the outer lining of the cell. It is represented by the plastic bag in our model.
- The nucleus is like the "brain" or "boss" of the cell. It holds all the instructions for the cell to do its job. It is represented by the plastic capsule in our model.
- The cell's instructions are located in DNA which is found in genes that are linked together in long structures called chromosomes. This is the genetic material for a cell and is represented by the pipe cleaners in our model.

All living things get their genes from their parents. The chromosomes containing the genes 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. One chromosome in each pair comes from the mother and one chromosome in each pair comes from the father. This is how people inherit traits, or characteristics, from their parents.

Different animals and plants have different numbers of chromosomes: Our cell model has 3 pairs of chromosomes, which is how many a mosquito has! Carrots have 9 pairs, giraffes have 31 pairs, and a kind of fern plant called "adder's tongue" has more chromosomes than any other living thing - 630 pairs!

Chromosomes are so tiny they are not visible in the cell's nuclues - not even under a microscope! Even though they are so small, in order to fit into the nucleus, the genetic material is in a special shape or form - a spiral shape called a helix.

SC College- and Career-Ready Science Standards 2021

Science & Engineering Practice: Engaging in Argument from Evidence.

Disciplinary Core Idea: LS1.A: Structure and function – Plants have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
Performance Expectation: 4-LS1-1 (foundational to 6-LS1-2)

Math Connection:

When participants learn that there are 50 trillion cells in the human body, they can engage in conversation about large numbers and identify various place values to better understand big numbers and build understanding of place value.

Key Concept: Number Sense and Base Ten

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Cosmic Coding

Big idea

An algorithm is a list of the steps that are needed to do a task.

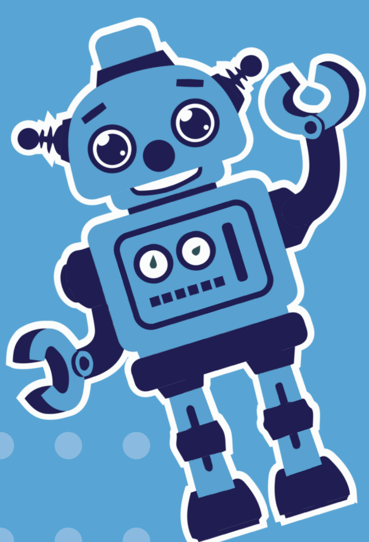
You will need

WHAT WE GAVE YOU:

- Cosmic Coding instructions and worksheets

STUFF YOU PROVIDE:

- pencils
- worksheets in Spanish (optional)



Set it up

Place the instruction sheets, worksheets, and pencils on a table. It's a good idea to review the worksheet ahead of time in order to make sure you understand the instructions as well as anticipate any questions the children may have.

It's showtime!

As families approach the table let them know they're going to learn a fundamental building block of computer programming: Algorithms. They'll be practicing on paper instead of working on a computer. Explain that coding is when you write an algorithm in a specific way. For this activity they will use arrows as the coding language that will take the astronaut to each spaceship and then back to Earth, all while making sure to avoid the asteroids!

They will use the blank spaces on the right-hand side of the worksheet to write the algorithm. For example, if they want the astronaut to first move three spaces to the right, they will write → → → in the area labelled "First Space Ship."

Challenge older students to write an algorithm with the smallest number of coding steps.

If they love it...

There are many websites that provide "unplugged coding" activities that can be done in the classroom or at home. A quick google search is all you need to find them! One example can be found at www.code.org/curriculum/unplugged.

Continued ›

SCIENCE FOR ALL • CIENCIA PARA TODOS •

Cosmic Coding

Why is this science?

This is Computer Science!

An algorithm is a list of the steps that are needed to do something. Each step is written as a specific instruction and in the correct order so that the task is completed in the right way. For example, each night before you go to bed you follow an algorithm to brush your teeth. Your list of steps might be to 1) take the cap off the toothpaste, 2) squeeze a small amount of toothpaste onto your toothbrush, 3) put the cap back on the toothpaste, 4) brush your teeth for two minutes, making sure you're cleaning all the sides and surfaces of each one, 5) rinse your mouth and your toothbrush with water.

Coding is when you write an algorithm in a specific way. For this activity we used arrows as the coding language to tell the astronaut the direction for each step of their way to the spaceships and then Earth. Computer programmers write code using programming languages that a computer can understand, such as Python, HTML5, Java, and SQL. If you want a computer to do one thing, then an algorithm is written. If you want a computer to do more than one thing, then you will need multiple algorithms combined into a computer program.

Every app, game, and software program that you have used was created by a computer programmer. If you enjoyed this activity, you may want to be a computer programmer too!

South Carolina Computer Science and Digital Literacy Standards 2017

Key Concepts: Computing Systems, Algorithms and Programming

Standard:

4.AP.1.1: Use step-by-step instructions to perform tasks.

4.AP.2.1: Use a combination of picture models to reorder a sequence of steps.

4.AP.2.2: Recognize that the same steps can be ordered in different ways to perform the same task.

Math Connection

The steps to write a code for the spaceship's path are similar to working on a coordinate plane with specific points and directions. Algorithms are essential in supporting students' understanding of mathematical concepts as they progress from conceptual understanding to procedural fluency.

Key Concept: Geometry, Algebraic Thinking and Operations

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Create-a-Coaster

Big idea

Experiment with the forces of motion by constructing a roller coaster for marbles!

You will need

WHAT WE GAVE YOU:

- plastic tubing
- cone-shaped paper cups
- plastic cups
- masking tape
- small marbles

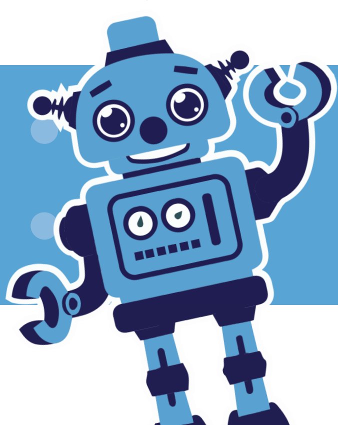
STUFF YOU PROVIDE:

- 2-4 chairs

Fun options

AHEAD OF TIME

Get extra tubing, available at any home improvement store, and connect two or more together with tape or binder clips to make an extra-long track!



Set it up

You will need to cut the tubing into 2-4 pieces and cut off the tips of the cone-shaped paper cups to create funnels for the marbles.

Set up one track as an example using the Instruction Sheet. Use masking tape to attach one end of the plastic tube to a wall (about 3-4 ft. up from the floor) or to the back of a chair. Turning an open folding chair upside-down provides even more coaster support.

You will need the cups to catch the marbles as they reach the end of each coaster.

It's showtime!

Challenge families to design and build a roller coaster using the plastic tubing as a track and a marble as the passenger. The only requirement is that the roller coaster must have at least one loop. That means that the marble will travel all the way around in a circle without stopping.

This activity will work best if members of a group are responsible for different jobs. Encourage group members to choose one of the following roles:

- Marble Dropper – responsible for releasing the marble at the top of the track when the group is ready to test their design.
- Marble Catcher – responsible for keeping track of and collecting the marble in the container at the end of the track.
- Construction Crew – because the track is light and flexible, the remaining members of the group are responsible for supporting the track and creating the shape and angle of the roller coaster.

Troubleshooting is an important part of engineering challenges. Encourage families to use observations they make about how their marble is traveling to adjust the shape of their track. Feel free to ask them questions like: What do you think is going to happen? Is your marble traveling too quickly or too slowly to make it around the loop? What could you change to make your marble go faster/ slower?

Continued ›

SCIENCE FOR ALL • CIENCIA PARA TODOS •

Create-a-Coaster

Why is this science?

Science is all about trying things out. This activity gives families the chance to test and re-test their designs while experimenting with energy and Newton's Laws of Motion. You may have noticed that most roller coasters start with a climb up a very large hill. This is because roller coasters don't have engines that power them through the ride. Instead, the car is pulled to the top of the first hill and released, at which point it rolls freely along the track without any mechanical assistance for the remainder of the ride, just like your marble. Roller coasters rely on gravity and energy to create the thrill of the ride.

There are two types of energy: Potential Energy (stored energy) and Kinetic Energy (energy of motion). When the marble is held at the top of the track before it is dropped it has potential energy. Once the marble is released, gravity pulls on the marble and it rolls down the track. The potential energy is changed into kinetic energy because the marble is in motion. As the marble enters the loop and starts to travel up the track, it slows down and the kinetic energy converts back into potential energy. After the top of the loop, as the marble begins to travel back down the track, the potential energy is again converted to kinetic energy. A roller coaster is constantly changing between potential and kinetic energy as the cars travel up and down hills and through loops. This give-and-take of energy creates the changes in speed and different sensations you experience when riding a roller coaster, which some find thrilling and others, not so much!

SC College- and Career-Ready Science Standards 2021

Science & Engineering Practice: Analyzing and Interpreting Data

Disciplinary Core Idea: PS2.A: Forces and motion – Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. ES1.A: Defining and delimiting an engineering problem – A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. **Performance Expectation:** K-PS2-1, K-PS2-2, 3-PS2-2, 5-PS2-1

Math Connection:

Participants can use a stopwatch to time how fast the marble travels down the coaster and use the formula speed = distance/time to calculate the average speed of the marble.

Key Concept: Measurement and Data Analysis, Algebraic Thinking and Operations

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Easy as Pi

Big idea

A circle is a shape that has a special attribute.

You will need

WHAT WE GAVE YOU:

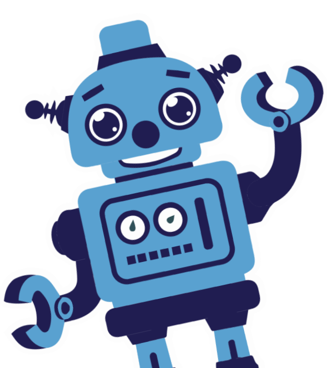
- circular templates
- ribbon
- transparent tape
- bookmark template sheets
- Easy as Pi instruction sheet

STUFF YOU PROVIDE:

- scissors
- circular templates that are different sizes and more ribbon for the Fun Option (optional)

Fun options

Have circular templates that are different sizes (and additional ribbon) to demonstrate that the same outcome will occur regardless of the size of the circle!



Set it up

Cut the bookmark template sheets into individual bookmarks. Cut the ribbon into pieces that are a little more than 3.14 times the diameter of the circular templates. For example, if using a circle that measures 6.75-inches across, each person will need AT LEAST 22 inches of ribbon. Place all the materials, including the Easy as Pi instruction sheet, on a table. It's a good idea to go through the activity ahead of time. 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 questions the children may have.

It's showtime!

As families approach, invite them to learn about a special attribute of circles. Tell them they'll be learning about the relationship between the circumference and diameter of a circle by using a ribbon to "do the math." Note that this activity is more easily done with a partner.

Give each student a circular template, piece of ribbon, and scissors. They'll first carefully wrap the ribbon around the outside of the circle and then cut it to the length of the circumference. They will then hold one end of the "circumference" ribbon onto one edge of the circle template, stretch the ribbon across the middle of the circle, and cut it to the length of the circle's diameter. They'll repeat this and cut as many "diameter" ribbons from the "circumference" ribbon that they can. After counting the pieces, they will see that there are 3 whole lengths and one partial length. The partial length, if measured, would be about one-seventh ($\frac{1}{7}$) of the whole length. Have the students tape their "diameter" ribbons to the bookmark.

Explain that anytime you divide the circumference of a circle by its diameter, no matter the size of the circle, you will get $3\frac{1}{7}$. Mathematicians have given this value the name, "π" or "pi" because there are an infinite number of decimal places to this number, which rounds to 3.14.

Continued ›

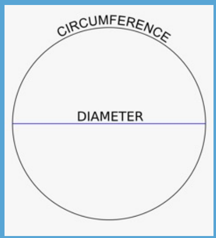
SCIENCE FOR ALL • CIENCIA PARA TODOS •

DUKE ENERGY SCIENCE NIGHT

Easy as Pi

Why is this science?

Learning about geometry shapes and attributes can seem intimidating, but this activity shows it can be as Easy as Pi! In this activity, we learned about the special relationship between the circumference and diameter of a circle by using a ribbon to “do the math."



After cutting the “circumference” ribbon, you had 3 whole lengths and one partial length of “diameter” ribbon to tape to your bookmark.

The partial length is a fraction of the whole length. If measured, it would be one-seventh ($\frac{1}{7}$) of the whole length of the diameter.

Anytime you divide the circumference of a circle by its diameter, no matter the size of the circle, you will get $3\frac{1}{7}$. If you calculate using decimal notation to the hundredth place, you get 3.14. The actual number is a decimal that never ends! Because there are an infinite number of decimal places to this value, mathematicians have given it the name, “π” or “pi”, which is pronounced just like pie.

SC College- and Career-Ready Standards for Mathematics 2015

Standards:

K.MDA.1 Identify measurable attributes (length, weight) of an object.

3.NSF.1 Develop an understanding of fractions as numbers (expanded to include other denominators).

Math Connection

Conversation with students can include discussion of fractional parts of a whole. In this case there are 3 whole lengths and one partial length when comparing the ratio of diameter to circumference. Early grade students can extend their thinking about the circle as a shape by being introduced to the attributes of diameter and circumference.

Key Concept: Measurement and Data Analysis, Number Sense – Fractions,

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DUKE ENERGY SCIENCE NIGHT

Galilean Cannon

Big idea

Use the law of conservation of energy to make your own "Galilean Cannon."

You will need

WHAT WE GAVE YOU:

- seismic accelerator (Astro Blaster)
- bouncy balls
- safety glasses
- Galilean Cannon instructions

STUFF YOU PROVIDE:

- a large area to serve as the launch zone*
- basketball and tennis ball (see fun options)

*Safety notes

This experiment requires adult supervision and an area with a lot of space and high (or no) ceilings.

It may be a good idea to mark the area as a launch zone.

The top ball can shoot off at high speeds; wear the safety glasses when using the seismic accelerator and perform the demonstration away from students.

Set it up

Mark off an area with plenty of open space - preferably with high ceilings or outdoors. Lay out the instruction sheet. It's a good idea to practice a time or two before the event begins so you will become familiar with the process.

It's showtime!

As families approach, ask them what happens when they drop a bouncy ball. They'll probably say it falls down, hits the ground, and bounces back into the air. You can demonstrate with one of the bouncy balls. Ask the students to observe that the ball bounces a little bit lower every time. Have them make predictions about what will happen when we try dropping the bouncy ball on top of a stack of other larger balls. Add the bouncy ball to the top of the seismic accelerator, then drop the entire contraption. Stand back - the top ball will shoot higher into the air!

Fun options

Before using the accelerator and the bouncy ball, demonstrate using a tennis ball to discuss the "law of conservation of energy" discussed on the back. You can then drop the tennis ball on top of a basketball to discuss the "elastic collision" and the Galilean Cannon.

If they love it...

Set up a mechanism to measure the height of the bounces.

Try this with different types and sizes of balls to see which Galilean Cannon bounces the top ball the highest.

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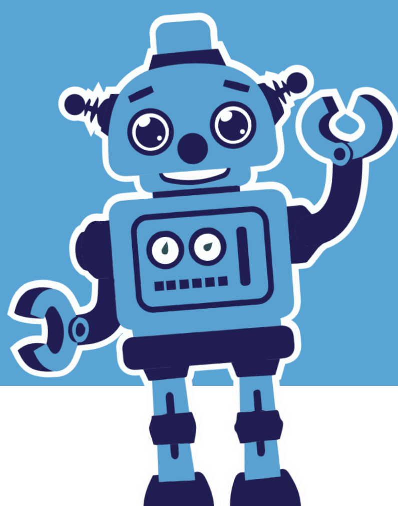

SCIENCE FOR ALL • CIENCIA PARA TODOS •

DUKE ENERGY SCIENCE NIGHT

Galilean Cannon

Why is this science?

In this experiment, we are using something called the law of conservation of energy, which states that energy cannot ever be created or destroyed, but it can be transformed. When we lift up a ball, we are giving it potential energy - the force of gravity will pull it back towards Earth, so we call this "gravitational potential energy." As the ball falls downwards, the potential energy changes into kinetic (or moving) energy. When the ball hits the ground and bounces back up, that kinetic energy changes back into potential energy. The ball bounces a little bit lower every time because some of the energy is lost to friction, sound, and heat as the ball changes shape when it hits the ground.

When we placed the bouncy ball on top of a stack of balls, we created a Galilean Cannon! When the largest ball hits the ground, it starts bouncing up into the air, but there's a smaller ball in the way. This creates something called an "elastic collision" and energy from the bottom ball is transferred to the next ball. When you stack more than two balls, you can transfer even more energy. This means that the top ball bounces upwards with its own energy plus extra energy from all the balls below it - allowing it to bounce way higher than it normally would!

SC College- and Career-Ready Science Standards 2021

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

Disciplinary Core Idea: PS2.A: Forces and motion – Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. PS2.B: Types of interactions – When objects touch or collide, they push on one another and can change motion. **Performance Expectation:** K-PS2-1, 3-PS2-1

Math Connection:

Participants can make predictions and estimate or measure the height of the bounces.

Key Concept: Measurement and Data Analysis

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Garden In A Glove

Big idea

Explore what seeds need to grow by "planting" five different kinds of seeds in the fingers of disposable gloves.

You will need

WHAT WE GAVE YOU:

- disposable gloves
- markers
- cotton balls
- containers
- 5 different kinds of seeds
- craft sticks
- twist ties
- Garden in a Glove instruction sheet

STUFF YOU PROVIDE:

- water
- paper towels

Fun Options

AHEAD OF TIME:

Provide additional types of seeds for families to choose from when planting their Garden in a Glove, like herbs or wildflowers.

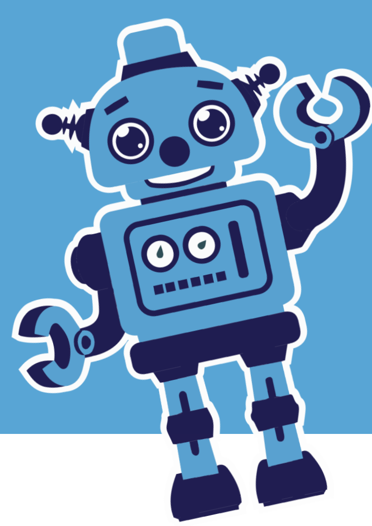
Set it up

Fill 5 of the containers with seeds and 2 of them with water. Lay out the materials in order from left to right: disposable gloves, markers, cotton balls, water, seeds, craft sticks, and twist ties. Place the Garden in a Glove instructions on the table. It's a good idea to make your own Garden in a Glove 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 face when "planting" their gardens. If you expect a large crowd, it's a good idea to pre-label gloves to help speed up the process.

It's showtime!

As families approach your table, ask them: What do you think seeds need in order to grow into plants? They will probably say things like water, sunlight and dirt. Let them know that they are going to plant a garden without using any soil. Explain that most seeds only need water and a warm place to begin to grow. Seeds have their own food stored inside of them, a tissue rich in starch and protein called endosperm, so they do not need sunlight or nutrients from soil until they have sprouted and developed roots. Help students "plant" their Garden in a Glove according to the instructions.

Note: Younger children may have trouble getting the cotton ball into specific fingers of the glove. Encourage an adult or an older sibling to help them by rolling down the top of the glove and holding it open for them (as if putting on a sock).



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SCIENCE FOR ALL • CIENCIA PARA TODOS •

DUKE ENERGY SCIENCE NIGHT

Garden In A Glove

Why is this science?

Most plants begin their life cycle as seeds. While seeds come in many shapes and sizes, they all pretty much serve the same function. Most seeds only need water and a warm place to begin to grow. Seeds have their own food stored inside of them, a tissue rich in starch and protein called endosperm, so they do not need sunlight or nutrients from soil until they have sprouted and developed roots.

Each seed contains a baby plant that will start to grow under the right conditions. The first stage in seed growth is called germination, which is when a tiny root(s) emerges from the outer seed covering. After the root(s) emerge, the stem and leaves begin to grow upward. Once a seed has germinated, the tiny growing plant is usually called a seedling.

There are several external factors which can affect seed germination. The most important external factors include: temperature, water, oxygen and sometimes light or darkness. Common garden seeds, like those used in this activity, germinate with water and warmth.

SC College- and Career-Ready Science Standards 2021

Science & Engineering Practice: Planning and carrying out investigations; Developing and using models; Engaging in argument from evidence.

Disciplinary Core Idea: LS1.C: Organization for matter and energy flow in organisms – All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow LS2.A: Interdependent relationships in ecosystems – Plants depend on air, water, minerals (in the soil), and light to grow. Different plants survive better in different settings because they have varied needs for water, minerals, and sunlight. **Performance Expectation:** K-LS1-1, 2-LS2-1, 3-LS1-1, 5-LS1-1

Math Connection:

With advanced preparation, the concept of timelines or graphing data could be incorporated into this activity station. Have a volunteer prepare multiple examples (at different times) of the seed "planting" well in advance to allow for germination to be seen by the time of the event. A visual representation of the growth of the plant could be charted and then students could discuss the graph and make predictions about the expected continued growth.

Key Concept: Measurement and Data Analysis

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ADAPTED IN PARTNERSHIP WITH SCCMS

South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Magnetic Painting

Big idea

Explore how magnetic fields can be used to pull things together… and to make art!

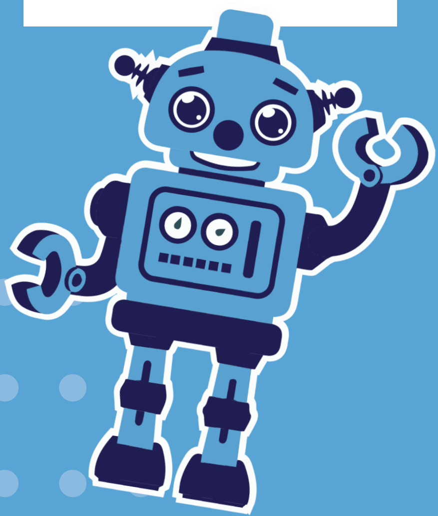
You will need

WHAT WE GAVE YOU:

- paper plates
- washable paint
- magnetic wands
- Magnetic Painting instruction sheet

STUFF YOU PROVIDE:

- assorted metal objects
- additional paint colors (optional)
- paper towels/ wipes
- pens or markers



Set it up

Ahead of time, collect metal objects from your school. On the night of the event, set out the supplies in the following order: paper plates, paint, metallic objects, magnetic wands, and Magnetic Painting instruction sheet. At the end of the table you may wish to have pens or markers so that the students can write their name on the back of their plate and leave it to dry.

It's showtime

As families approach your station, ask if they've ever used a magnet to attach art or a note to their refrigerator or the classroom whiteboard. Everyone likely knows the feeling when a magnet and a magnetic material come close to each other and join together with a sudden 'snap'. This is because magnets create an invisible magnetic field around them. Metal objects that contain the elements iron, nickel, or cobalt are attracted to this magnetic field.

Now they're going to use this knowledge to create art! Give each student one paper plate. Place two to four dime-sized drops of paint on their plate (note: any more and the plate will get soggy and floppy.) Let the student pick a few of the metal objects to place on their plate. The student should hold the plate with one hand and hold the magnetic wand under the plate with the other hand. As they slowly move the wand around, they will drag the metal objects through the paint and create their own masterpiece! If younger students have difficulty holding the plate and wand at the same time, ask a parent or friend to hold the plate while the student holds the magnetic wand.

Continued ›

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Magnetic Painting

Fun options

Collect an assortment of metal objects that will interact with the magnets. Students can create more variety in their artwork with items like springs and ball chains.

If they love it...

Use a variety of magnetic objects in different shapes and sizes. Have students make observations about the strength of the magnetic force as well as the paint patterns created by each object.

Why is this science?

All magnets have the ability to attract other magnets or magnetic objects, such as paper clips. But a magnet doesn't necessarily have to touch a magnetic object for the object to be attracted to it. (That is why the paper plate can be between the magnet and the objects.) The invisible area around a magnet is called a magnetic field. Magnetic objects will pull towards the magnet if they are placed in this field.

Magnets attract only certain types of metals (such as iron, nickel, and cobalt.) Most metals are actually not attracted to magnets. These include copper, silver, gold, magnesium, platinum, aluminum, and more. Other materials such as glass, plastic, and wood are also not attracted to magnets.

SC College- and Career-Ready Science Standards 2021

Science & Engineering Practice: Planning and carrying out investigations; Constructing explanations and designing solutions

Disciplinary Core Idea: 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 relatives to each other. **Performance Expectation:** 3-PS2-4

Math Connection:

Encourage participants to discuss any shapes, patterns, or symmetry they find in their painting.

Standard: Geometry

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Ring Gliders

Big idea

It doesn't need to look like an airplane in order to fly! Build a ring glider to experiment with the four forces of flight.

You will need

WHAT WE GAVE YOU:

- paper
- transparent tape
- Ring Glider instructions

STUFF YOU PROVIDE:

optional: hula hoop for target

Fun options

Use hula hoops as targets: have one family member hold the ring and challenge the students to throw their glider through it! Or, have larger paper or paper of different thickness or weight, like construction paper or card stock, so participants can experiment with different materials. Which makes the best glider?

Set it up

Ahead of time, cut 8.5"x11" sheets of paper in half to make 8.5"x5.5" sheets.

Lay out Ring Glider instructions, paper and tape on table. Make sure you have a large open space for throwing ring gliders, as they can travel pretty far!

It's a good idea to make your own ring glider 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 with building their own ring glider.

It's showtime!

Encourage families to have fun making and flying their ring gliders according to the provided instructions. Straight, crisp folds make for better flight.

There are a few ways to throw the ring glider. Participants can wrap their hand around the glider, nose side facing out and pitch it underhand. Alternatively, participants can wrap both their hands around the glider, hold above their head, and then push forward and release. Because the gliders can fly quite far, it is fun to play catch with them, or compete to see whose glider can travel the furthest.

If they love It...

Challenge families to adapt the designs – what's the biggest ring glider they can make that still works? What happens if you connect multiple rings? Or, what other designs can they create and fly?

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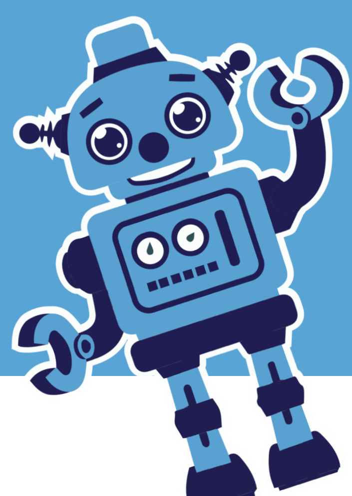

Ring Gliders

Why is this science?

In order to fly, an object needs to overcome the force of gravity. The earth's gravity pulls things down, so these ring gliders have to take advantage of other forces that temporarily override gravity's pull. Lift is a force created by air flowing over the curved surface of the ring, and thrust is the force given to the glider when you throw it. Both lift and thrust help keep the ring glider in the air. Drag is the resistance met when the ring glider moves through the air; it slows forward motion, which reduces lift. The ring glider is a very compact design, which helps decrease drag. So because lift and thrust are stronger than drag and gravity, the glider will fly.

SC College- and Career-Ready Science Standards 2021

Science & Engineering Practice: Planning and carrying out an investigation; Analyzing and interpreting data

Disciplinary Core Idea: PS2.A: Forces and motion – Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. PS3.C: Relationship between energy and forces – A bigger push or pull makes things speed up or slow down more quickly. **Performance Expectation:** K-PS2-1, K-PS2-2, 3-PS2-2, 5-PS2-1

Math Connection:

Encourage participants to measure the length their gliders travel OR amount of time spent in the air with a stopwatch. Set up a graph for participants to add their measurements to compare the distances of their flights.

Key Concept: Measurement Data and Analysis

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South Carolina STEM Education Month

DUKE ENERGY SCIENCE NIGHT

Straw Flutes

Big idea

Explore how sounds are made by building a noisemaker.

You will need

WHAT WE GAVE YOU:

- straws
- masking tape
- Straw Flute instruction sheet

STUFF YOU PROVIDE:

- adult scissors

Fun Options

Have some empty bottles on hand for kids to try blowing across. Different sizes of bottles will make different sounds!

Set it up

Set out the straws, tape, scissors, and Straw Flute instruction sheet on your table. Make a straw flute ahead of time so that students know what the finished product will look like. (Note that when you follow the directions, you will actually make 2 straw flutes at a time. You have enough straws for 200 flutes, so you will need to have students work in pairs or keep the second flute to give to another student.)

It's showtime!

Ask families if anyone has ever played a musical instrument. Let them know that today they will get the chance to make and play one. Have students (preferably with a partner) select 10 straws and line them up evenly. Wrap masking tape around the straws near each end. Using scissors, cut diagonally through all ten straws. You now have two straw flutes! Demonstrate how to make sounds by blowing across the tops of the straws, not directly into them.

If they love It...

Ask kids if they can play a recognizable song on their straw flute. It may hard for one person to do it, but see what happens if each person plays one of the notes on their straw flute. Kids can work together to play a simple song like "Twinkle, Twinkle, Little Star" if they each have one note to play.

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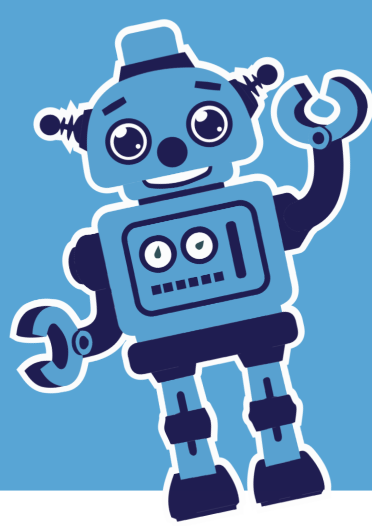

SCIENCE FOR ALL • CIENCIA PARA TODOS •

DUKE ENERGY SCIENCE NIGHT

Straw Flutes

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 straw flute, what's vibrating? The air inside each straw. When you blow across the top of your straw flute, you cause the air inside each straw to vibrate as it moves around. That movement of air is what we hear as sound.

Sounds can have different pitches, meaning how high or low it sounds. Blowing over shorter straws makes the pitch higher because there is less air to move so it can quickly vibrate. Blowing over longer straws makes the pitch lower because the greater volume of air vibrates 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.

SC College- and Career-Ready Science Standards 2021

Science & Engineering Practice: Planning and carrying out investigations

Disciplinary Core Idea: 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 – Sound can make matter vibrate and vibrating matter can make sound. **Performance Expectation:** 1-PS4-1, 4-PS3-2

Math Connection:

Challenge participants to measure the length of the straws and compare the length to the pitch that it makes.

Key Concepts: Measurement and Data Analysis

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