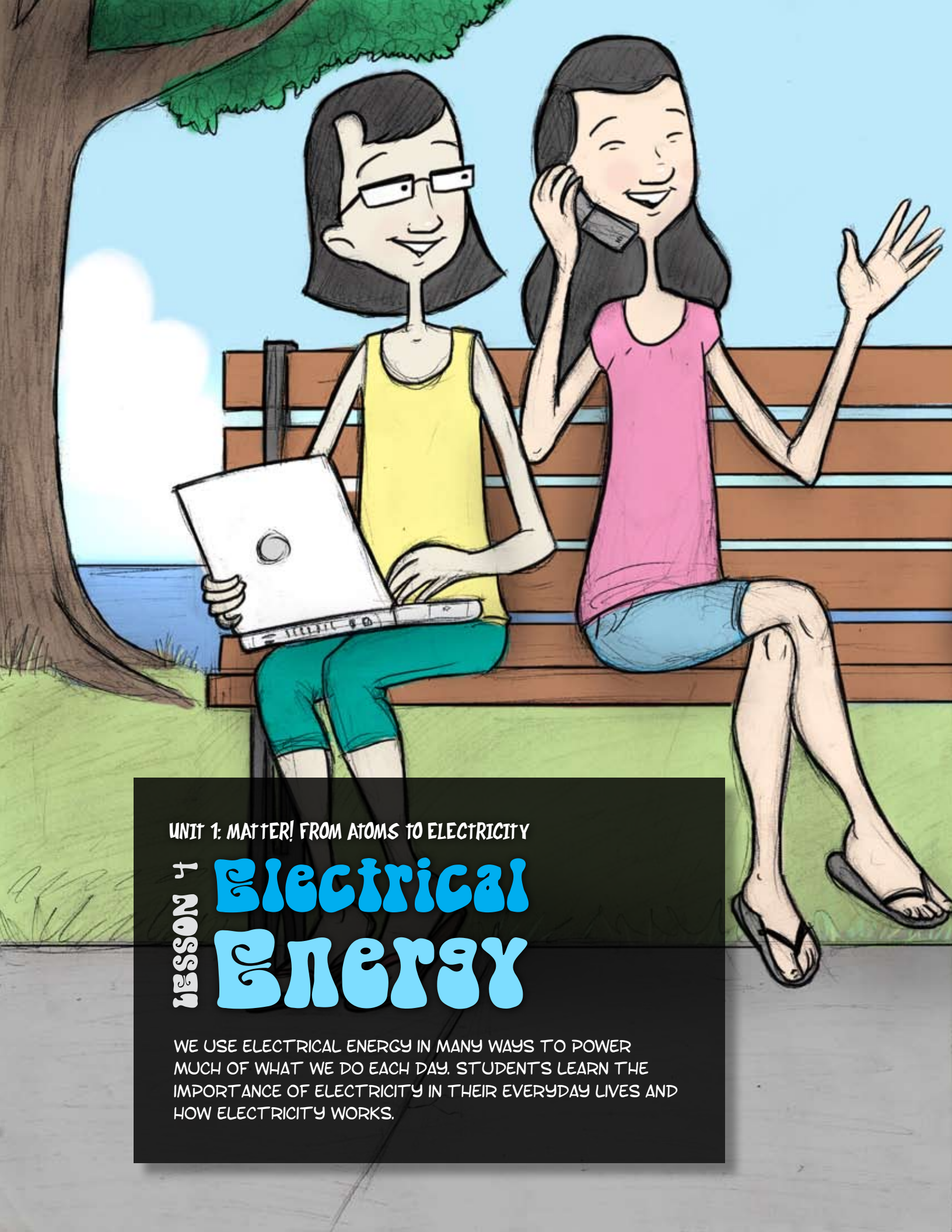
UNIT 1: MATTER! FROM ATOMS TO ELECTRICITY

LESSON 4

Electrical Energy



UNIT 1: MATTER! FROM ATOMS TO ELECTRICITY

LESSON 4

Electrical Energy

WE USE ELECTRICAL ENERGY IN MANY WAYS TO POWER MUCH OF WHAT WE DO EACH DAY. STUDENTS LEARN THE IMPORTANCE OF ELECTRICITY IN THEIR EVERYDAY LIVES AND HOW ELECTRICITY WORKS.

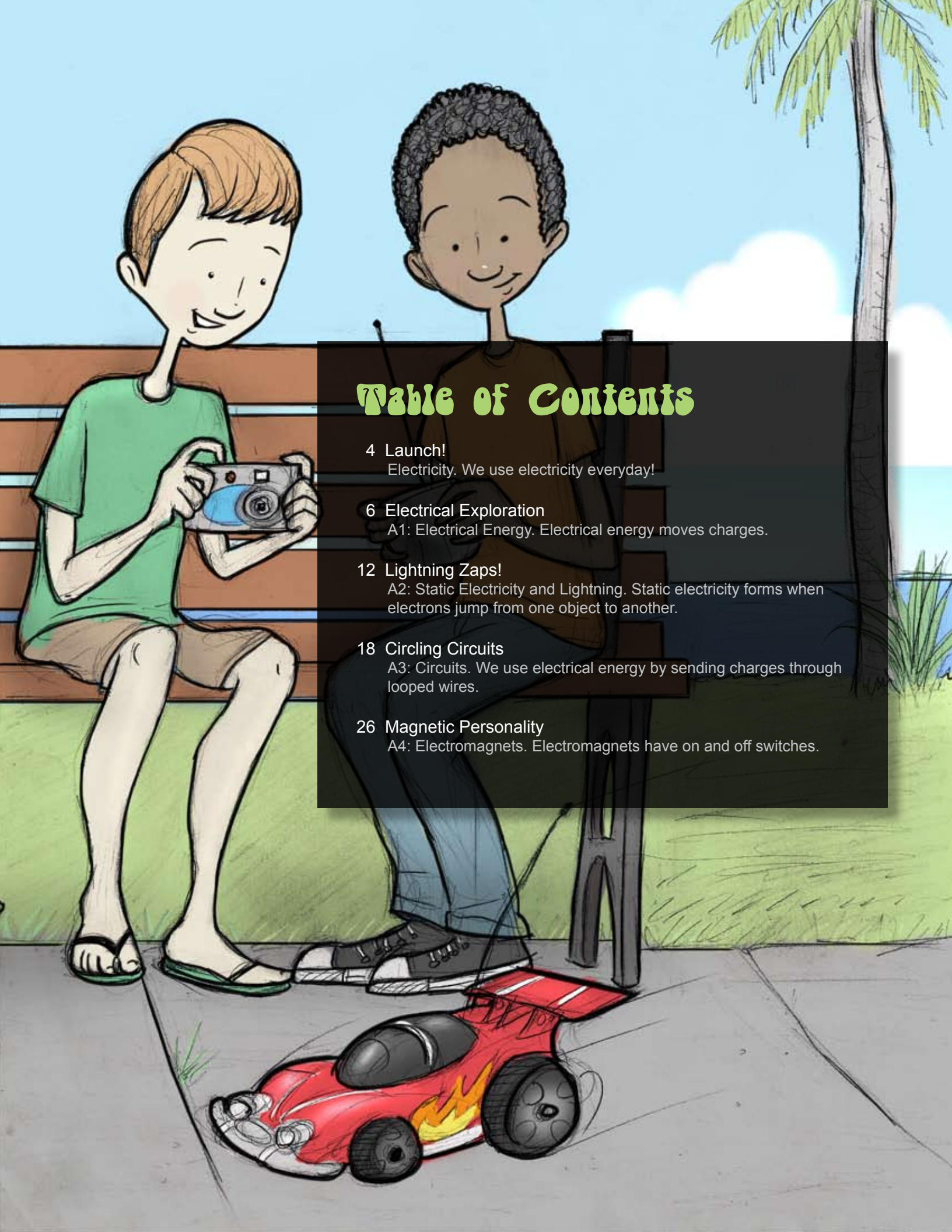
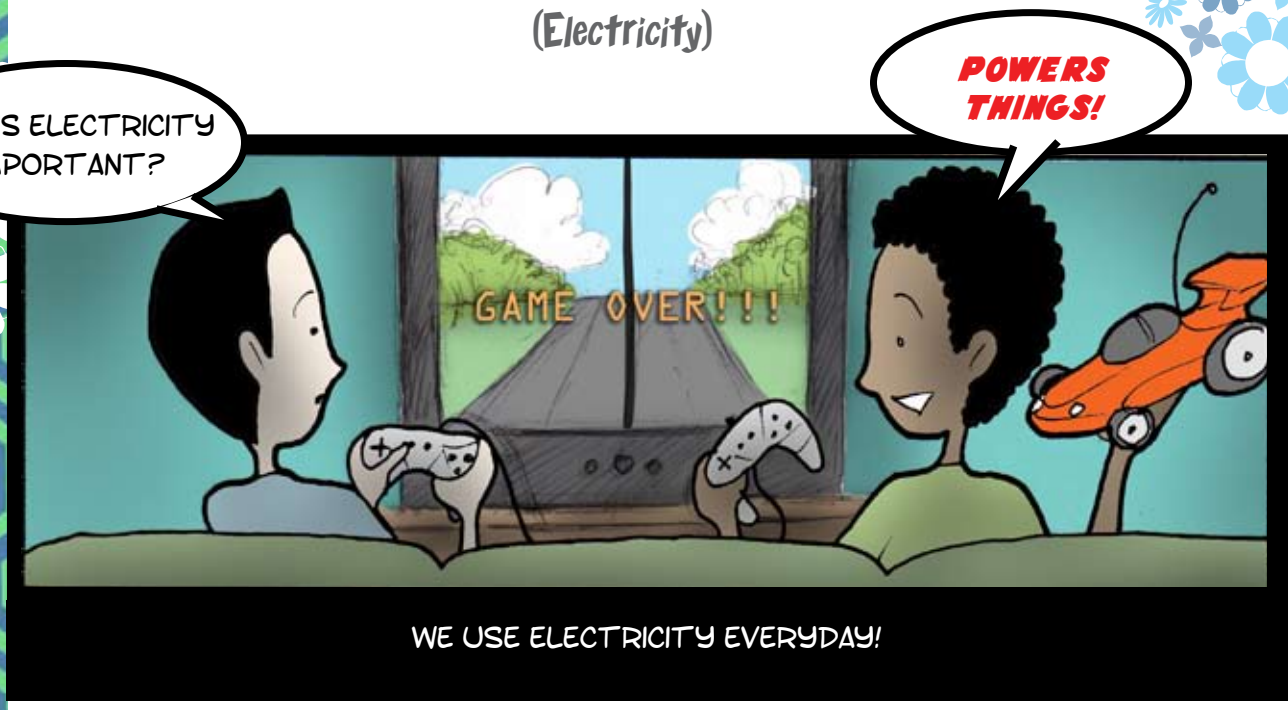


Table of Contents

Launch!
(Electricity)



Ready?

Nothing to prepare.

Set?

- Unit 1-Lesson 4-Activity 1: *Electrical Exploration* (Electrical Energy)
- Unit 1-Lesson 4-Activity 2: *Lightning Zaps!* (Static Electricity and Lightning)
- Unit 1-Lesson 4-Activity 3: *Circling Circuits* (Circuits)
- Unit 1-Lesson 4-Activity 4: *Magnetic Personality* (Electromagnets)

Go!

Develop Know-Wonder-Learn chart with students.

Materials

Writing materials

Hawaii Standards

SC.K.1.1
SC.K.2.1

SC.1.2.1

SC.2.2.1

Think about it…
Why is electricity important?

Launch!

Discover electricity as a class.

- Look around classroom.
  Find or think of something that can turn on and off.
- Sit in class circle.
  Go around circle. Share your item.
- Make a chart.
  Discuss what these objects have in common.
- Describe what people used before invention of these electronic.
  Add to your chart.

How it works

Power! Anything that turns on and off uses electricity. Think of lamps, refrigerators, computers, radios, and televisions. Uncle says anything with batteries also uses electricity.

Keiki Storytime

Switch On, Switch Off by Melvin Berger (J 537 B)

Did You Know?

Electricity exists in nature. Electrical power generated by human effort, however, makes our modern life possible.

Invention Center

No one person invented or discovered electricity. Many inventors, scientists, and researchers' pondered the subject for two millennia.

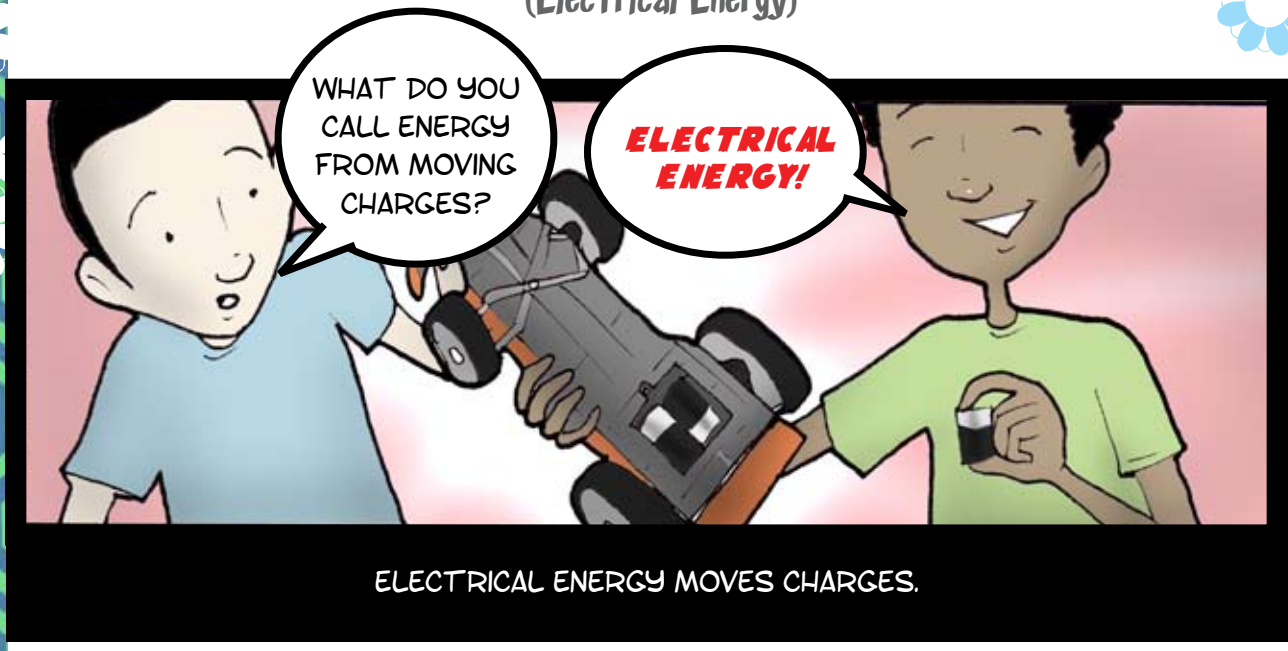
Just for Fun

Listen and sing along to a fun rap about different electronics that use batteries.

www.batterybill.com
>> Battery Bill song

Electrical Exploration

(Electrical Energy)



Materials

Flashlight (1 per student)
Batteries
Bouncing balls (1 per student)
Music
Scissors
Drawing materials

Hawaii Standards

SC.K.2.1

SC.1.1.1
SC.1.2.1

SC.2.2.1
SC.2.7.1

Ready?

Explore
Remove batteries from flashlights.

Evaluate
Learn to make an instant book:
YouTube.com >> Search "How to Make an Instant Book."
Cut 8.5x11 pages into squares.

Set?

- Unit 1-Lesson 1-Activity 4: *It's Elementary* (Elements)
- Unit 1-Lesson 4-Activity 2: *Lightning Zaps!* (Static Electricity and Lightning)
- Unit 1-Lesson 4-Activity 3: *Circling Circuits* (Circuits)
- Unit 1-Lesson 4-Activity 4: *Magnetic Personality* (Electromagnets)
- Unit 6-Lesson 1-Activity 1: *Chemical Collisions* (Chemical Energy)

Go!

Develop Know-Wonder-Learn chart with students.

Think about it...
What are positive and negative charges?

Engage

Play *Attract and Repel* as a class.

- Discuss the words *attract* and *repel*.
- Pretend to become a magnet.
  Your hands have a positive charge and your shoulders a negative one With a partner, demonstrate attract and repel.
- Attract as a class.
  Put both hands (+ charge) on your partner's shoulder (- charge). Walk in the same direction, like a train. When you pass other pairs, join up to make one long train.
- Repel as a class.
  Every other person turn and face the person in back of you. Hold hand out in front of you, but not touching. Repel! Can you stay in a line and walk straight without being touched by the person in front of you?

Scientists Say...

...*electrons* for negative atom pieces and *protons* for positive ones.

Did You Know?

Electricity has no color, weight, size, or smell.

What's in a Word?

Electricity comes from the Greek word *elektron*, which means *amber*. Ancient Greeks noticed electricity after rubbing amber on sheepskin.

Historical Note

Benjamin Franklin (1706-1790) discoverd positive and negative electrical charges and that electricity forms lightning.

Electrical Explorations

Think about it...
How do electrons move in order to create electricity?

Explore

Rebuild a flashlight battery circuit individually.

- Take batteries out of your flashlight.
- Put batteries in flashlight without checking '+' and '-' sign.
  Turn on flashlight. Did it work?
- Take batteries out again.
  Find '+' and '-' signs on battery.
- Look at battery picture on flashlight.
  Observe '+' and '-' signs.
- Reposition batteries.
  Position them as shown in picture. Turn on flashlight. Observe.
- Discuss how this was like your *Attract and Repel* line (U1.L4.A1-page 7).

Explain

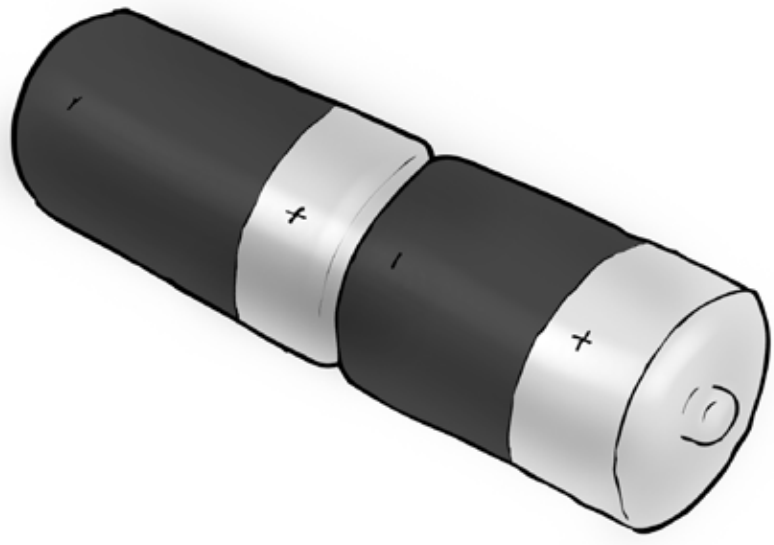
Electrical energy results from the movement of charges.

What are positive and negative charges?

Protons and electrons! Remember those tiny building blocks of matter we call atoms? Aunty says atoms have positive parts (protons) and negative parts (electrons). A positive and negative charge will attract each other. Positive and positive charges (or negative and negative) will repel each other.

How do electrons move in order to create electricity?

In a line! Batteries must be lined up correctly in order for the electrical current to move in a circle. If two similar sides touch, they repel each other and the flashlight will not work.



Scientists Say...

...electric field for the space surrounding an electric charge.

Did You Know?

Electricity travels at the speed of light - more than 186,000 miles per second!

Invention Center

Alessandro Volta (1745-1827) invented the first battery.

Electrical Explorations

Think about it...
How do you make charges move?

Elaborate

Play *Pass the Electrons* as a class.

- Pick up a ball in class circle.
  Imagine your body has a positive charge (proton) and the ball a negative charge (electron). Start music.
- Circle ball around your waist.
  Circle ball until music stops.
- Bounce pass your ball to the person on your right when the music stops.
  Make sure to catch the ball from the person on your left!
- Circle ball around your waist when music starts.
- Discuss applying force (bounce pass) to make postive (body) and negative (ball) charges move to create electricity.

How it works

Force! Negative charges prefer to circle their proton. A force, such as lightning, magnets, burning fossil fuel, or turning a windmill, pushes them into moving! Moving charges creates electricity!

Evaluate

What do you call energy from moving charges?

Create an instant book. (Directions: Youtube.com>>Search "How to Make an Instant Book.")

- Cover: Write the title, *"Story of Electricity*."
- First page: Draw a picture of an atom.
  Example: hydrogen has one proton, no neutrons, and one electron (U1.L1.A3-page 24)
- Continue book in *Evaluate* section throughout this lesson.

How has society changed as a result of electricity?

Assess

SC.K.2.1 Identify different types of technologies at home, in the classroom, and/or in the world.

SC.1.1.1 Collect, record, and organize data using simple tools, equipment, and techniques safely.

SC.1.2.1 Explain why people create technological devices.

SC.2.2.1 Describe changes that have occurred in society as a result of new technologies.

SC.2.7.1 Identify the properties of magnets.

Did You Know?

There are many ways to create electricity: friction (static), chemical reactions (battery), mechanical motion (generators), heat (thermocouples), and light (solar cells).

Interesting Fact

There are many uses for electricity, such as transportation, heating, lighting, communication, entertainment.

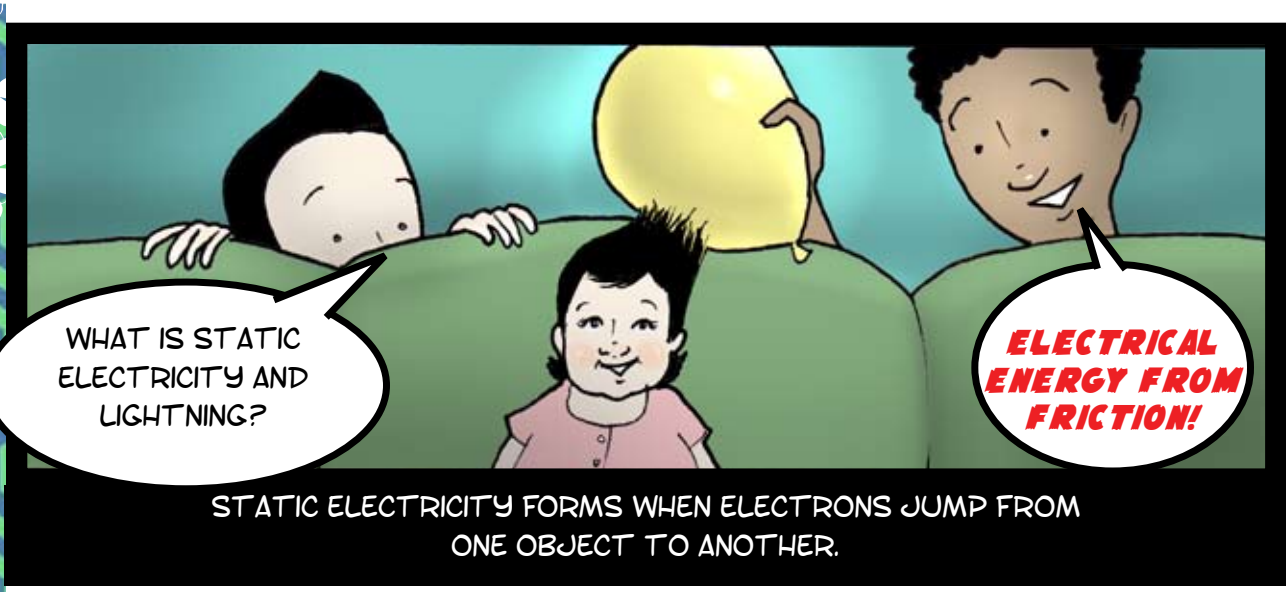
NOAA Link

Learn about basic electrical safety from NOAA's National Weather Service,

www.noaa.gov
Search "Basic Electrical Safety"

Lightning Zaps!

(Static Electricity and Lightning)



Materials

Balloons (1 per student)
Newspaper
Paper plate
Unflavored gelatin
Piece of wool
Cardboard
Scissors
Ruler
Pens
Glue
Hole punch
Rubber bands (2 per student)
Instant book (U1.L4.A1-p. 11)
Drawing materials

Hawaii Standards

SC.K.1.1
SC.K.1.2

SC.1.1.1
SC.1.2.1

SC.2.1.1
SC.2.1.2
SC.2.2.1

Ready?

Engage
Blow up balloons (one per student).

Explore
Place newspaper over work area.
Reuse balloons from Engage (U1.L4.A2-page 13).

Elaborate
Cut cardboard circles with two inch diameters (one per student).

Set?

- Unit 1-Lesson 1-Activity 4: *It's Elementary* (Elements)
- Unit 1-Lesson 4-Activity 1: *Electrical Exploration* (Electrical Energy)
- Unit 1-Lesson 4-Activity 3: *Circling Circuits* (Circuits)
- Unit 1-Lesson 4-Activity 4: *Magnetic Personality* (Electromagnets)

Go!

Develop Know-Wonder-Learn chart with students.

Think about it...
What is static electricity?

Engage

Create static electricity with friction individually.

- Rub balloon in your hair for twenty seconds.
- Pull balloon away from hair.
- Observe your hair.
- Discuss what you think occured.

Interesting Fact

You generate static electricity when you drag your feet on the floor at an air conditioned store and then touch a shopping cart. Zap!

Did you know?

Static electricity forms best in low humidity. In humid air, water molecules collect on materials, which prevents electrical charges from attaching.

Just for fun!

Have a race! Line up two empty aluminum cans on a smooth, flat surface. Rub a balloon with a piece of wool. Hold balloon near a can, but do not touch it. Watch the balloon repel the can.

Lightning Zaps!

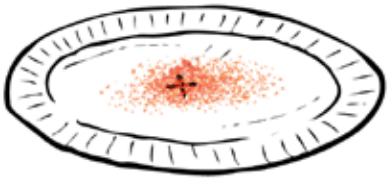
Think about it...
How does lightning form?

Explore

Make charged-particles travel individually!

- Identify ground.
  Draw "+" on paper plate. Pour unflavored gelatin on plate.
- Identify cloud.
  Draw "+" on top of balloon. Draw "-" on bottom of balloon.
- Rub wool on "-" side of balloon for 20 seconds.
- Hold negatively charged area of balloon over gelatin powder.
  Do not touch the powder with the balloon. Hold the positive section of the balloon.
- Observe and record what happens.
- Slowly raise balloon.
  Record what happens.

** Activity Extension**
Turn into an experiment.



- Ask a question.
  Are all powdered substances positively charged?
- Do background research.
- Construct a hypothesis.
  "If (I do this), then (this) will happen."
- Make a prediction.
- Test with an experiment.
  Create a control: Unflavored gelatin is the control, because you tested it and know that the negative side of your balloon attracts the gelatin, which can be classified as positively charged. Create variables: Test different powdered substances, such as salt, pepper, sugar, baby powder.
- Analyze data.
- Communicate results.

Explain

Friction occurs when two surfaces rub against one another. Friction causes static electricity when the negative electrical charges from one surface attracts to the other surface.

What is static electricity?

Electrical charge buildup! The balloon picked up the electrons from your hair and became negatively charged. Since your hair lost its electrons, it became positively charged. Uncle says because opposites attract, hair moved toward the balloon.

How does lightning form?

Static electricity! Lightning forms when ice and water particles collide in a cloud and become charged. Thunderclouds become negatively charged, just like your balloon when rubbed with the wool. Objects on the ground are positively charged. The negative charge attracts the positive one, which causes lightning!

Invention Center

Photocopiers use static electricity! The machine electrically charges ink so that it will stick to the paper in the designated areas.

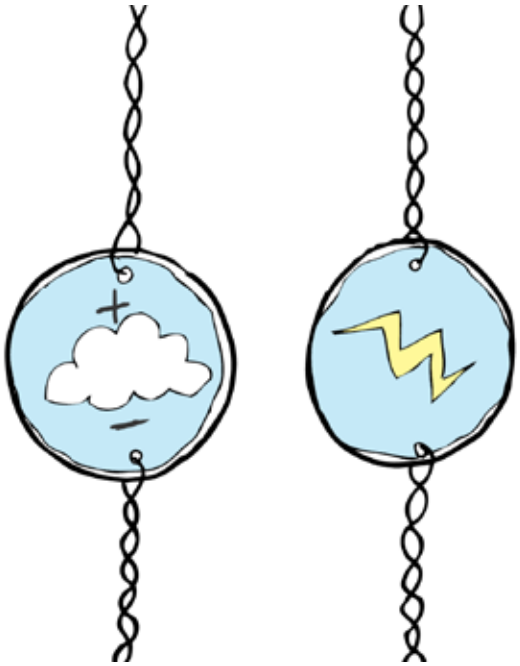
Did You Know?

Air ionizers work by attracting electrons from smoke molecules, dust particles, and pollen in the air, just like static electricity.

Interesting Fact

When H-Power (or any power plant) burns fuel, small particles escape out the smokestack. To capture it, engineers use static electricity!

Lightning Zaps!



Think about it...
What is the most common lightning in Hawaii?

Elaborate

Create a lightning optical illusion craft individually.

- Make two paper circles.
  Use cardboard circle to trace. Cut out paper circles.
- Draw lightning bolt on one circle and a cloud on the other.
  Color both. Draw a minus sign at the bottom of your cloud and a positive sign at the top of your cloud.
- Glue paper circles onto each side of your cardboard circle.
  Punch a hole at the top and bottom.
- Thread a rubber band through each hole.
  Loop rubber band through itself.
- Twirl the disk by winding the rubber band.
  As the disk unwinds, watch the lightning bolt and the cloud.
  Like magic, the lightning bolt will be coming from the cloud!

How it works

Sheet lightning! This type of lightning occurs inside one cumulonimbus cloud (thunderstorm cloud). The negative charges at the bottom of the cloud reacts with the positive charges at the top of the cloud. Aunty says here in Hawaii, we mostly see sheet lightning close to the horizon.

Evaluate

What is static electricity and lightning?

Fill in your instant book from Activity 1 (U1.L1.A1-page 11).

Page two: Draw a picture of static electricity in action.

Can lightning occur between a positive cloud and a positive ground?

Assess

SC.K.1.1 Use the senses to make observations.
SC.K.1.2 Ask questions about the world around them.

SC.1.1.1 Collect, record, and organize data using simple tools, equipment, and techniques safely.
SC.1.2.1 Explain why people create technological devices.

SC.2.1.1 Develop predictions based on observations.
SC.2.1.2 Conduct a simple investigation using a systematic process safely to test a prediction.
SC.2.2.1 Describe changes that have occurred in society as a result of new technologies.

Keiki Storytime

The Story of Lightning and Thunder by Ashley Bryan (J 398.2 B)

Did you know?

Lightning heats the air around it so quickly that it causes thunder. Since Hawaii has so little lightning, we do not have much thunder.

Historical Note

Benjamin Franklin proved thunderbolts were electricity when he tied an iron key to a kite and harnessed its electrical charge during a storm.

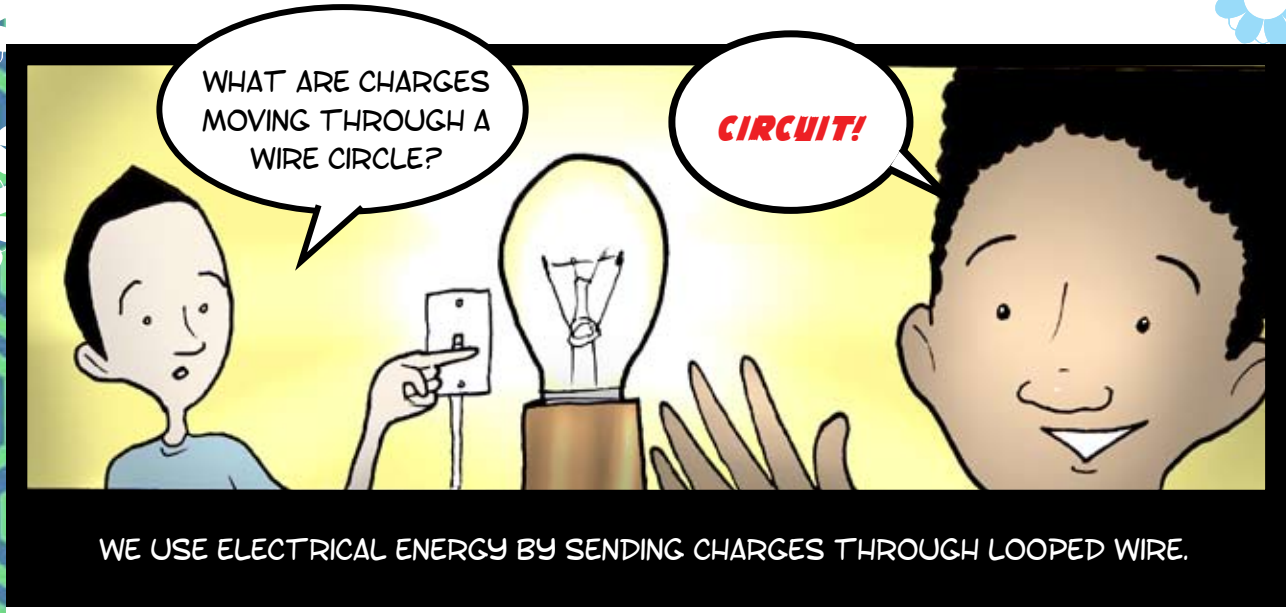
NOAA Link

NOAA provides lightning safety tips.

www.lightningsafety.noaa.gov
>>Kids Page

Circling Circuits

(Circuits)



Materials

Circuit Hokey-Pokey (mp3 and lyrics)
Flour (3 cups)
Salt (¼ cup)
Sugar (½ cup)
Cream of tartar (3 Tbsp)
Water (1 cup)
Distilled water (½ cup)
Vegetable oil (2 Tbsp)
Granulated alum (1 Tsp)
Food coloring (Optional)
Large mixing bowl
Stirring spoon
Insulated copper wires (1 red, 1 black per group)
Electrical tape
AA batteries (1 per group)
LED lightbulb (5mm or 10mm) (1 per group)
Wire stripper
Drawing materials

Hawaii Standards

SC.K.1.1
SC.K.1.2
SC.K.2.1
SC.1.1.1
SC.1.2.1
SC.2.1.1
SC.2.1.2
SC.2.2.1

Ready?

Explore
Familiarize yourself with *Circuit Hokey-Pokey* lyrics (U1.L4.A3-page 20).

Elaborate
Make conductive salt dough (divide dough between groups).
See appendix for instructions (U1.L4.A3-page 24).

Make insulating salt dough (divide dough between groups).
See appendix for instructions (U1.L4.A3-page 24).
At the time of publication, granulated alum was not available in Hawaii stores, but is readily available online.

Set?

- Unit 1-Lesson 4-Activity 1: *Electrical Exploration* (Electricity)
- Unit 1-Lesson 4-Activity 2: *Lightning Zaps!* (Static Electricity and Lightning)
- Unit 1-Lesson 4-Activity 4: *Magnetic Personality* (Electromagnetism)

Go!

Develop Know-Wonder-Learn chart with students.

Think about it...
How does electrical energy flow through circuits?

Engage

Model a circuit individually.

- Create a closed circuit.
  Touch your thumbs together and your fingers togther. Make a big "O" with your hands. Say, "closed circuit."
- Open your circuit.
  Release your fingers, but keep your thumbs touching. Make a "U" with your hands. Say, "open circuit."
- Repeat faster.

"CLOSED CIRCUIT!"

"OPEN CIRCUIT!"

Reading Resource

What is Electricity? by Lisa Trumbauer (J 537 Tr)

What's in a Word?

Circuit comes from the Latin roots *circum* (around) and *ire* (to go).

Just for Fun!

Say "Circling circuits" ten times!

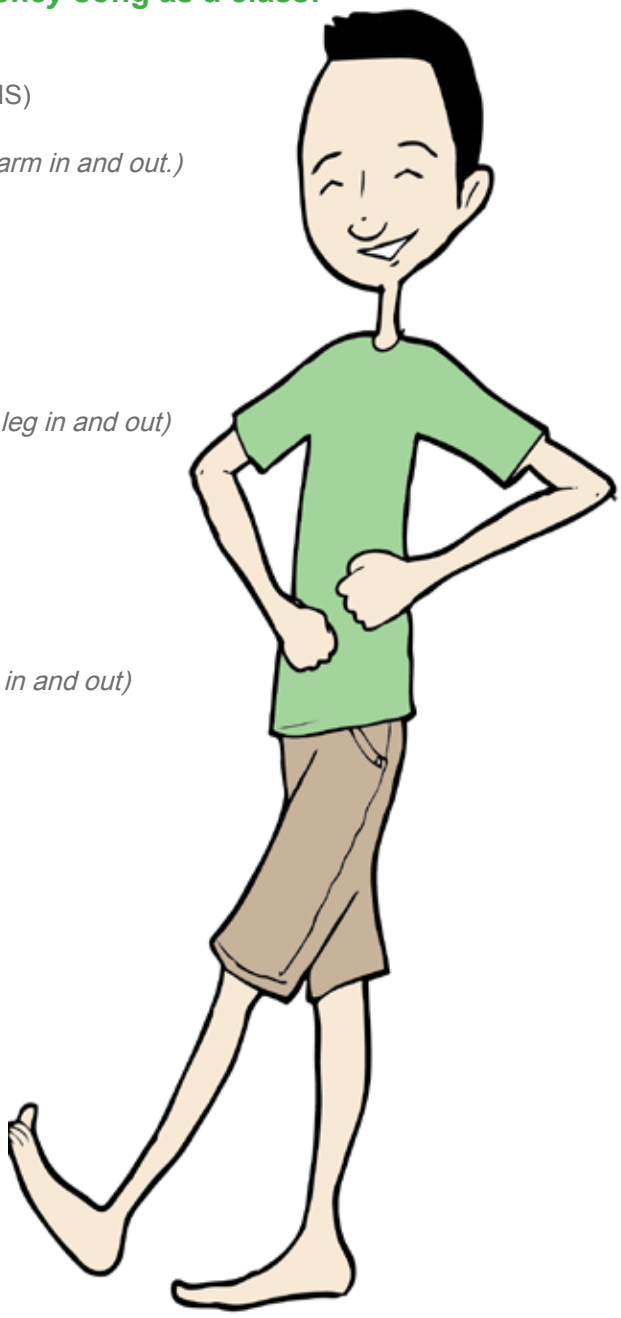
Circling Circuits

Think about it...
What are the three parts of a circuit?

Explore

Sing and dance to the *Circuit Hokey-Pokey* song as a class!
(Tune: *Hokey-Pokey*)

(LYRICS)	(MOTIONS)
Put your power source in. *Pull your power source out.* *Put your power source in* *and shake it all about.* *Do the circuit hokey-pokey* *and give yourself a charge.* *That's what it's all about!*	*(Put right arm in and out.)*
Put your pathway in. *Pull your pathway out.* *Put your pathway in* *and shake it all about.* *Do the circuit hokey-pokey* *and give yourself a charge.* *That's what it's all about!*	*(Put right leg in and out)*
Put your receiver in. *Pull your receiver out.* *Put your receiver in a* *nd shake it all about.* *Do the circuit hokey-pokey* *and give yourself a charge.* *That's what it's all about!*	*(Put head in and out)*



Explain

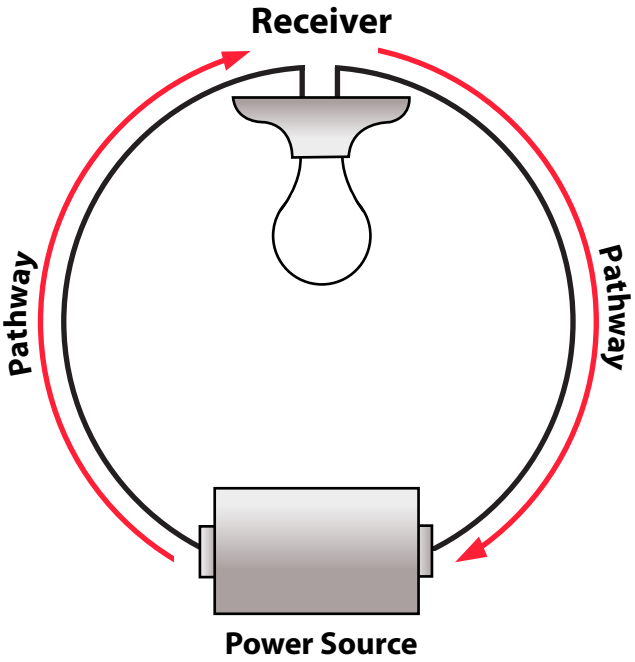
We harness electrical energy and use it to power everything from lights to computers to toasters.

How does electrical energy flow through circuits?

Open or closed! Electrical charges get pushed through metal wires. The current can only flow through a wire forming a circle (closed current). It stops flowing if the circle opens (open current).

What are the three parts of a circuit?

Circuits have three basic parts: energy source (battery, wall socket), energy receiver (light bulb, remote control car), and energy pathway (wires).



Reading Resource

Magic School Bus and the Electric Field Trip by Joanna Cole (J 621.3 Co)

Website Resource

To learn about energy inventors, visit the US Energy Information Administration.

www.eia.doe.gov

>> Energy Kid >> History of Energy

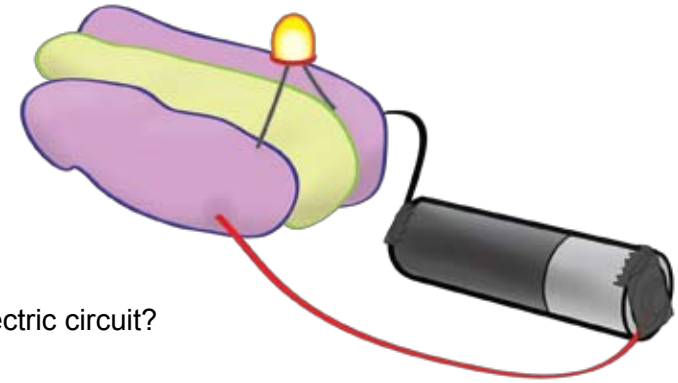
NOAA Link

Learn ten things you can do to help lower your parent's electric bill with NOAA's Safety and Environmental Compliance Office!

www.noaa.gov

Search "Energy Awareness"

Circling Circuits



Think about it...
How do you make an electric circuit?

Elaborate

Make a *Squishy Circuit* in small groups.

- Discuss what you know about circuits.
  What are the parts of a circuit? How does electricity flows through them?
- Build a circuit.
  See directions: U1.L4.A3-page 24.
- Divide conductive dough into two balls.
  Roll balls into logs.
- Roll insulating dough into a log.
- Place two conductive dough logs around insulating dough.
  Insert each of the battery wires into a separate logs of conductive dough.
- Insert end of LED light into seperate conductive dough.
  Turn on battery pack!
- Touch battery wires to ends of battery
  What happens if only one wire touches battery?
- Try making different shapes with the dough.
  WARNING: Do not blend the conductive and insulating doughs together. Circuit will not work.

How it works

Receiver, source, pathway! Connect an energy receiver (light bulb) to an energy source (battery) with an energy pathway (wire) and the light will turn on when you make a circle with the wires. Tutu says wires carry electricity in a big circle. When you turn a switch off, you break the circle. Electricity cannot travel if the circuit is open.

Alternate Activity
Build a non-squishy electric circuit in small groups.
See appendix (U1.L4.A3-page 25) for directions.

Evaluate

What are charges moving through a wire circle?

Complete your instant book from Activity 2 (U1.L4.A2-page 17).

On page three: Draw a picture of a circuit and label the three main parts.

How do Thomas Edison's inventions apply electricity?

Assess

SC.K.1.1 Use the senses to make observations.

SC.K.1.2 Ask questions about the world around them.

SC.K.2.1 Identify different types of technologies at home, in the classroom, and/or in the world.

SC.1.1.1 Collect, record, and organize data using simple tools, equipment, and techniques safely.

SC.1.2.1 Explain why people create technological devices.

SC.2.1.1 Develop predictions based on observations .

SC.2.1.2 Conduct a simple investigation using a systematic process safely to test a prediction.

SC.2.2.1 Describe changes that have occurred in society as a result of new technologies.

Interesting Fact

Some materials, like metal, lose electrons easily. These make good conductors. Others, like rubber, hold onto electrons tightly. These make good insulators.

Invention Center

Thomas Edison (1847-1931) invented more than 2,000 new products, including almost everything needed for us to use electricity in our homes: switches, fuses, sockets and meters.

NOAA Link

Watch a video produced by NOAA about different technologies available to generate energy from the ocean.

www.learningdemo.com/noaa

>> Lesson 11

SALT DOUGH DIRECTIONS

U1-L4-A3: CIRCLING CIRCLES (ELABORATE)

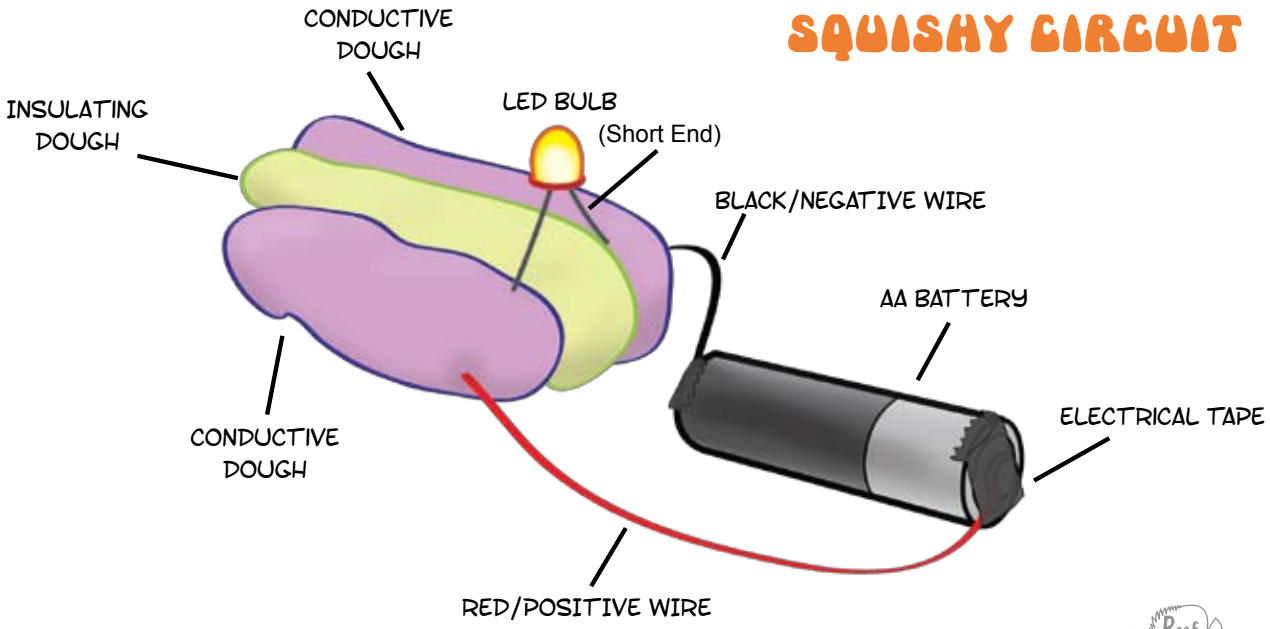
Conductive Salt Dough

1. Mix one cup water, two and a half cups of flour, one fourth cup salt, 3 tablespoons cream of tartar, 1 tablespoon vegetable oil, and food coloring in a medium sized pot.
2. Cook over medium heat and stir continuously. The mixture will begin to boil and start to get chunky.
3. Keep stirring the mixture until it forms a ball in the center of the pot. Once a ball forms, place the ball on a lightly floured surface. WARNING: The ball will be very hot. We suggest flattening it out and letting it cool for a couple minutes before handling.
4. Slowly knead the remaining flour into the ball until you've reached a desired consistency. Store in an airtight container or plastic bag.
5. While in the bag, water from the dough will create condensation. This is normal. Just knead the dough after removing it from the bag, and it will be as good as new. If stored properly, the dough should keep for several weeks.

Insulating Salt Dough

1. Mix one cup flour, half a cup sugar, one teaspoon granulated alum, and three tablespoons vegetable oil in a pot or large bowl. (Set aside ½ cup flour to be used later.)
2. Mix with this mixture a small amount of deionized water (about 1 Tbsp.) and stir.
3. Repeat this step until a majority water is absorbed by the mixture. Once your mixture is at this consistency, knead the mixture into one "lump".
4. Knead more water into the dough until it has a sticky, dough-like texture.Now, knead in flour to the dough, until a desired texture is reached.
5. Store in an airtight container or plastic bag. While in the bag, water from the dough will create condensation. This is normal. Just knead the dough after removing it from the bag, and it will be as good as new. If stored properly, the dough should keep for several weeks.

SQUISHY CIRCUIT



ELECTRIC CIRCUIT

U1-L4-A3: CIRCLING CIRCLES (ELABORATE)

Materials

Light bulb holder (1 per group)
Wooden block (1 per group)
Screws (2 per group)
Insulated copper wires
(1 red, 1 black per group)
AAA battery holder (1 per group)
AAA batteries (2 per group)
Lightbulb (1 per group)
Wire stripper
Various metal and non-metal items

Build an electric circut and light a bulb in small groups!

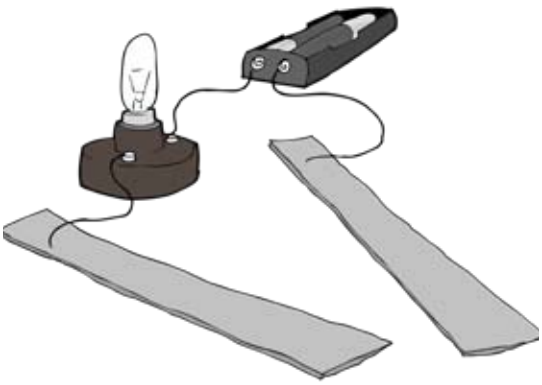
- Secure lightbulb holder to wooden block with screws.
- Strip the ends of the wires quarter-inch with wire stripper.
  Twist black wire to screw on to one side of bulb holder.
  Twist red wire to screw on to other side of holder.
  NOTE: Some stores sell circuit packs with all materials included.
- Discuss what you know about circuits.
  How does electricity flows through them?
- Explore how to turn on the bulb using the materials provided.

How it works

Receiver, source, pathway! Connect an energy receiver (light bulb) to an energy source (battery) with an energy pathway (wire) and the light will turn on when you make a circle with the wires. Wires carry electricity in a big circle. When you turn a switch off, you break the circle. Electricity cannot travel it's circuit open.

Activity Extension

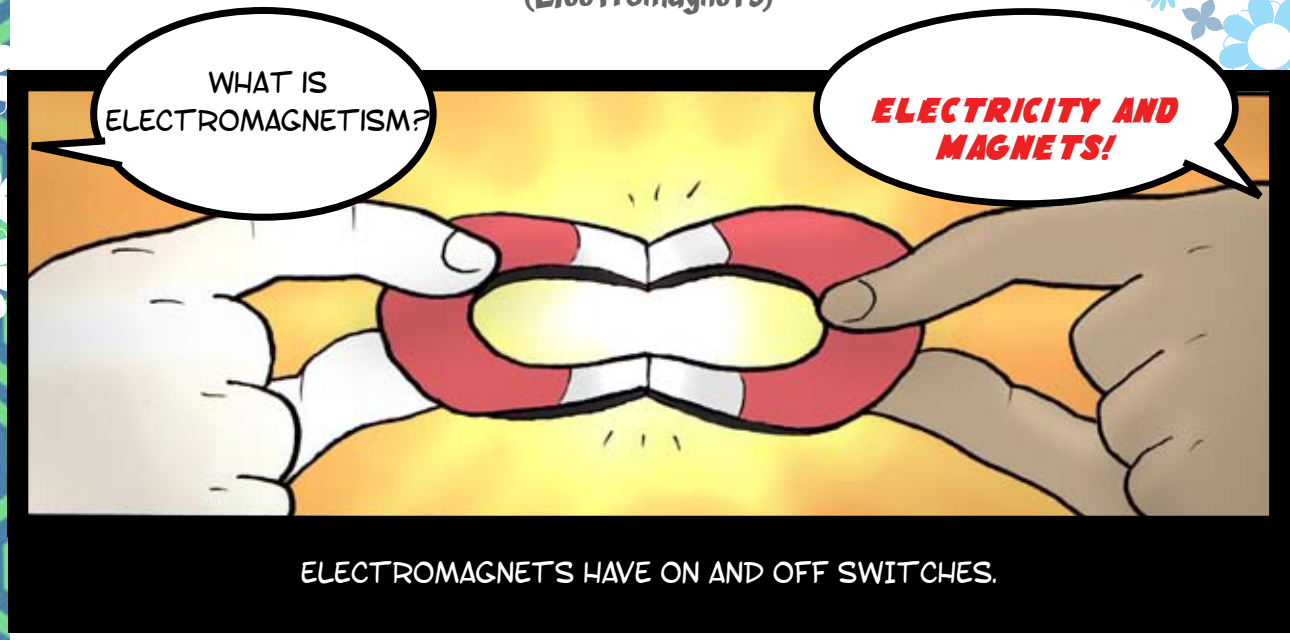
Experiment with conductors and insulators in small groups.



- Ask a question.
  What happens if you add another metal piece to your circuit?
  What if you add a non-metal piece?
- Do background research.
  Research conductors and insulators.
- Construct a hypothesis.
  "If (I do this), then (this) will happen."
- Make a prediction.
  Predict which items in the bag are conductors (move electrons freely) and which are insulators (hold on to their electrons and resist the flow of current through them). Place the items in two piles.
- Test with an experiment.
  Test them with your circuit.
- Analyze data.
- Communicate results.

Magnetic Personality

(Electromagnets)



Materials

Bar magnet (2 per group)
Magnetic object
Non-magnetic object
Ruler (1 per group)
Metal and non-metal worksheet (U1.L4.A4-p.30)
Large iron nail (3 inches) (1 per group)
Thin, coated copper wire (3 feet) (1 per group)
D battery (1 per group)
Paper clips
Electric tape
Compass (1 per group)
Instant book (U1.L4.A3-page 23)
Drawing materials

Hawaii Standards

SC.K.1.1
SC.K.1.2
SC.K.2.1

SC.1.1.1
SC.1.1.2
SC.1.7.1

SC.2.1.1
SC.2.7.1

Ready?

Explore

Gather magnetic and non-magnetic objects.

Examples: penny, nickle, dime, twig, tack, paper clip, bits of aluminum foil, rubber band, paper, safety pin

Photocopy *Metal and Nonmetal* worksheet (U1.L4.A4-page 30) (one per student).

Elaborate

Test if your nail is iron or steel by touching it to a magnet.

If it sticks, it is iron or steel. If not, they mat be aluminum or some other metal.

Leave eight inches of wire at one end and wrap rest of wire around nail ten times. Do not overlap wires.

Cut wire so there is eight inches on the opposite end.

Remove one inch of plastic coating from both ends of wire.

Set?

- Unit 1-Lesson 4-Activity 1: *Electrical Exploration* (Electrical Energy)
- Unit 1-Lesson 4-Activity 2: *Lightning Zaps!* (Static Electricity and Lightning)
- Unit 1-Lesson 4-Activity 3: *Circling Circuits* (Circuits)
- Unit 4-Lesson 4-Activity 1: *Compass Capers* (Directions)
- Unit 5-Lesson 5-Activity 5: *Turtle Tales* (Sea Turtles Life Cycle)

Go!

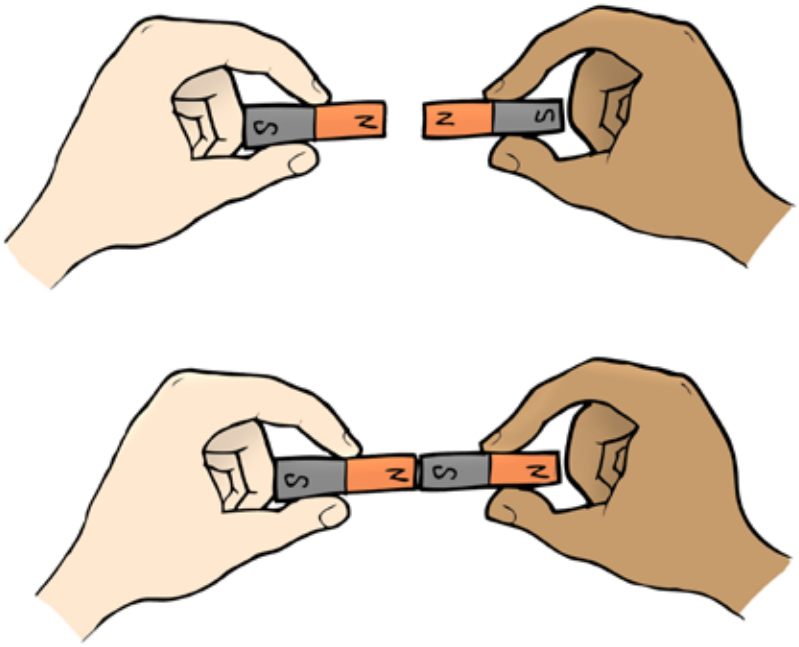
Develop Know-Wonder-Learn chart with students.

Think about it...
How do magnets react to each other?

Engage

Do *Opposites Attract* activity in small groups.

- Observe how bar magnets react to each other.
- Measure how close to each other you can move the magnets before they interact.
- Record and share results.



Reading Resource

What Makes a Magnet? by Franklyn M. Branley (J 538.4078 B)

Did You Know?

Magnets get their name from an ancient Greek town called Magnesia. According to legend, a shepherd in the town discovered a magnetic rock when his iron cane stuck to it. This magnetic rock is now called magnetite.

Interesting Fact

Electric charges from thunderstorms produce invisible electromagnetic fields. This causes a compass needle to point north-south.

Magnetic Personality

Think about it...
What types of objects are magnetic?

Explore

Conduct a magnetic experiment in small groups.

- Ask a question.
  Are all metal objects magnetic?
- Do background research.
- Construct a hypothesis.
  "If (I do this), then (this) will happen."
- Make a prediction.
  Write the names of the objects in your box in the first column of the worksheet (U1.L4.A4-page 32). Circle your prediction in the second column.
- Test with an experiment.
  Create a control: Use another bar magnet as your control. Create variables: Test whether the magnet will attract or repel the other objects in your pile. Move the magnet over the object. Circle attract, repel, or no effect to show what happened. Put the magnet over the object again. Circle attract, repel, or no effect to show what happened the second time. Make a pile of items attracted to the magnet. Make a second pile of items not attracted to the magnet.
- Analyze data.
  Discuss what material in the objects makes them magnetic.
- Communicate results.

Explain

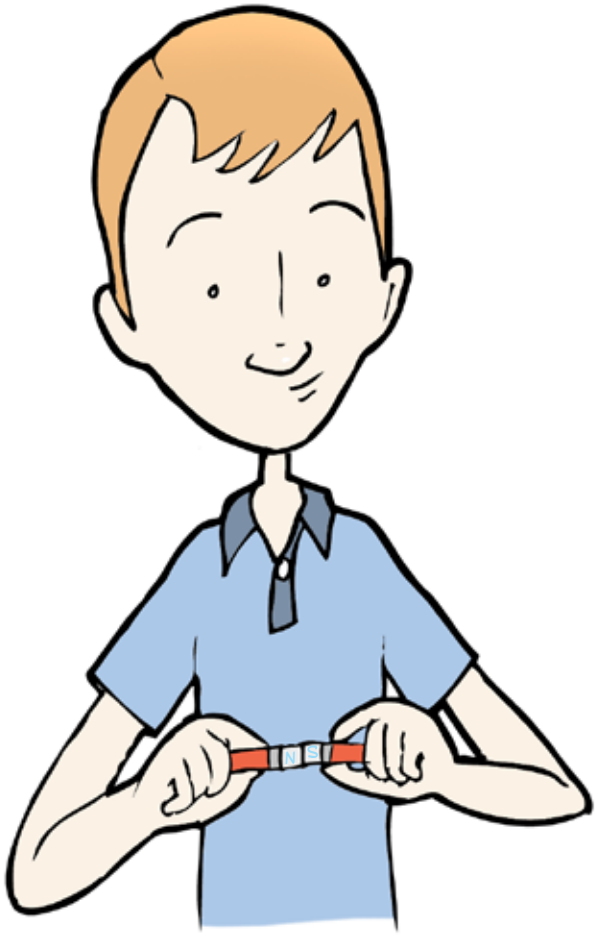
Magnets and electricity closely relate. Magnets can make electricity flow. Flowing electricity can have a magnetic force!

How do magnets react to each other?

Attract and repel! Bring two ends of your magnet together again. What do you feel? A force! All magnets have two poles: north and south. Aunty says poles just means ends. If you put two similar sides together (positive and positive), they will push (repel). If you put two opposite sides together (positive and negative), they will pull (attract).

What types of objects are magnetic?

Metal ones! All the items that stuck to your magnet are made of iron. The other items were not. Even though they may be metal, they do not have iron in them.



Interesting Fact

Electroreception refers to an animal's ability to perceive electrical impulses. Aquatic creatures more often have this "sixth sense" because saltwater conducts electricity better than air.

On a Related Note...

Sharks are the most electrically sensitive animals known. Sharks and rays have a special organ in their snout. They use electromagnetism to find fish and crustaceans.

NOAA Link

Scientists think sea turtles have built-in bits of magnetite, creating their own compass. NOAA scientists study sea turtles a lot!

www.pifsc.noaa.gov
Search "Turtle Research"

Magnetic Personality

Think about it...
What is an electromagnet?

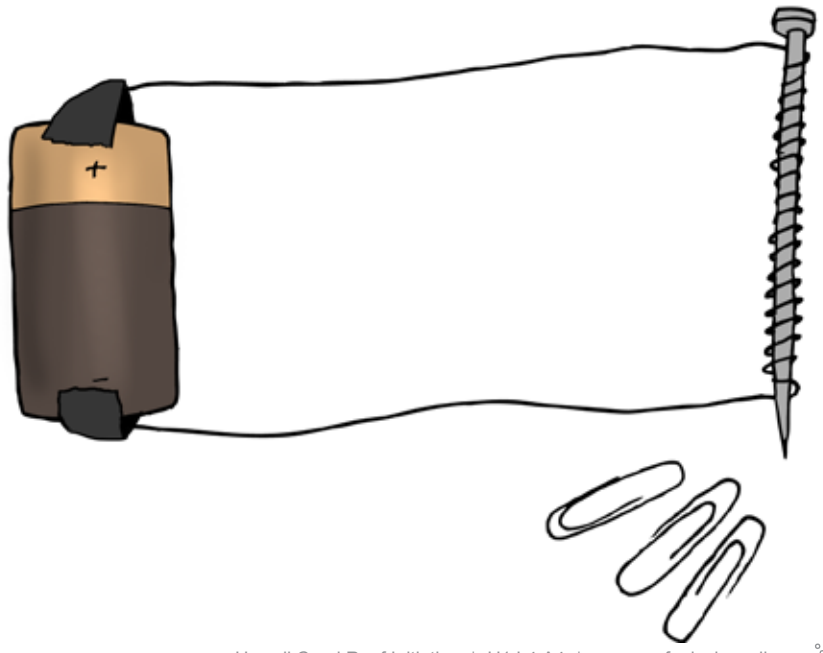
Elaborate

Create a simple electromagnet in small groups.

- Start with the wire-wrapped nail and D-battery.
- Connect one wire to one end of battery and other wire to other end of battery.
  Tape wires to battery.
- Put point of nail near paper clips.
  Observe what happens.
- Untape one wire.
  Observe what happens to paper clips.
- Put point of nail near compass.
  Observe what happens.

How it works

Magnet with an electric current! You made electricity flow through the wire with a battery. It created a magnetic force strong enough to pick up paper clips! But when you open the circuit by untaping the wire, the nail loses its magnetic force.



Evaluate

What is electromagnetism?

Fill in your instant book from Activity 3 (U1.L4.A3-page 23).

On page four: Draw a picture of an object that uses electromagnets.

Why would you use electromagnets instead of regular magnets in a junkyard to move old cars?

Assess

SC.K.1.1 Use the senses to make observations.

SC.K.1.2 Ask questions about the world around them.

SC.K.2.1 Identify different types of technologies at home, in the classroom, and/or in the world.

SC.1.1.1 Collect, record, and organize data using simple tools, equipment, and techniques safely.

SC.1.1.2 Explain the results of an investigation to an audience using simple data organizers (e.g., charts, graphs, pictures).

SC.1.7.1 Describe how the motion of an object can be changed by force (push or pull).

SC.2.1.1 Develop predictions based on observations.

SC.2.7.1 Identify the properties of magnets.

Did you know?

We use electromagnets in electric motors. These include washing machines, computers, televisions, medical equipment and more!

Invention Center

Michael Faraday (1791-1867) discoverd electromagnetism.

NOAA Link

Learn how scientists track Earth's magnetic field at NOAA's National Geophysical Data Center.

www.ngdc.noaa.gov

Search "Geomagnetism Frequently Asked Questions"

MAGNETIC EXPERIMENT

U1-L4-A4: MAGNETIC PERSONALITY (EXPLORE)

1. Gather magnetic and non-magnetic objects/materials for testing.

2. In small groups predict (guess) whether the magnet will attract or repel each object. Circle your prediction in the second column.

3. Move the magnet over the object. Circle attract, repel, or no effect to show what happened.

4. Put the magnet over the object again. Circle attract, repel, or no effect to show what happened the second time.

5. Make a pile of items that were attracted to the magnet. Make a pile of items that were not attracted to the magnet.

OBJECT	PREDICTION	1ST TRY	2ND TRY
	attract repel no effect	attract repel no effect	attract repel no effect
	attract repel no effect	attract repel no effect	attract repel no effect
	attract repel no effect	attract repel no effect	attract repel no effect
	attract repel no effect	attract repel no effect	attract repel no effect
	attract repel no effect	attract repel no effect	attract repel no effect
	attract repel no effect	attract repel no effect	attract repel no effect