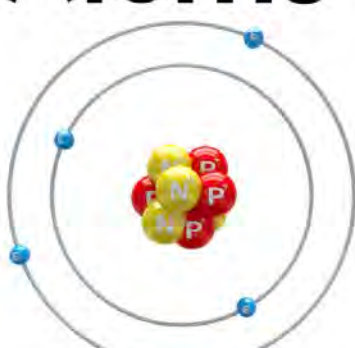


Static Electricity 5E Lesson Plans

Big Idea Posters

Atoms



have protons and electrons.

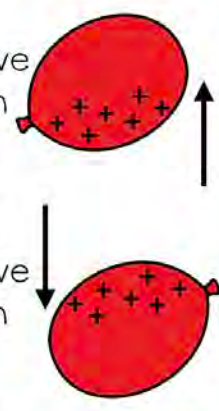
Opposite charges attract.

Positive charges move toward negative charges.



Like charges repel.

Positive charges move away from positive charges. Negative charges move away from negative charges.



Lightning happens because of static electricity.

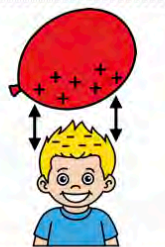


A static electric shock happens when negative charges flow very fast toward positive charges.



8 Exit Tickets in three formats

Vocabulary Cards

	Buildup of electrons on an object's surface.
static electricity	
	Moving toward an object. Opposite charges are attracted to each other.
attract	

Exit Ticket Name: _____ How does static electricity build up?	Exit Ticket Name: _____ How does static electricity build up?
--	--

Exit Ticket Name: _____ When objects are rubbed quickly, they may lose _____. The _____ electrons flow to the thing that rubs it. This is how _____ electricity builds up.	Exit Ticket Name: _____ When objects are rubbed quickly, they may lose _____. The _____ electrons flow to the thing that rubs it. This is how _____ electricity builds up.
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Exit Ticket Name: _____ How does static electricity build up? a. When objects are left alone, the balanced charges flow to it. b. When objects are rubbed, protons flow to the thing that rubs it. c. When objects are rubbed, electrons flow to the thing that rubs it. d. When objects are left alone, neutral charges stay in one place.	Exit Ticket Name: _____ How does static electricity build up? a. When objects are left alone, the balanced charges flow to it. b. When objects are rubbed, protons flow to the thing that rubs it. c. When objects are rubbed, electrons flow to the thing that rubs it. d. When objects are left alone, neutral charges stay in one place.
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Static Electricity 5E Lesson Plans

Engage

Engage Teacher Background

The purpose of the *Engage* section of the 5E instructional model is to **pique student interest and spark curiosity in the current topic**. Students are encouraged to **connect their prior knowledge** with a current situation or example given by the teacher.

The role of the teacher is to raise questions and uncover current student understanding and misconceptions. The students ask questions and show interest in the topic.

Since this is the very beginning of the *Engage* section, the purpose is to **introduce the vocabulary and science concepts in the topic**. Students are encouraged to **bring wonder and discovery into the topic**.

You do not have to do all three activities. If you need to shorten the amount of time to do either Part 1 or Part 2 of this section, you can choose to do only one with the class, you will more accurately reach all learning objectives. You will also be able to reach all learning objectives.

- * Part 1: "What Is This?"
- * Part 2: "My Experiences"
- * Part 3: "Introducing..."

Engage

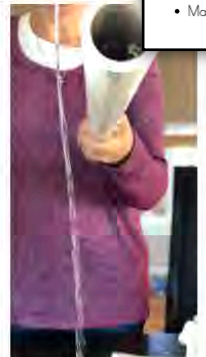
Objectives	Duration	Materials
- Students will access their prior knowledge about static electricity. - Student interest in static electricity will be sparked (pun intended). - The teacher will be able to identify student misconceptions about static electricity.	- Part 1 (What Is This?): 10 minutes - Part 2 (My Experiences): 10 minutes - Part 3 (Introducing): 20 minutes	- Activity Sheet - Large foam cup - Plastic tub or box full of water - PVC pipe - Picture - Inflated balloon - Wool or Nylon cloth or sock - Plate or tray (any material except styrofoam) ½ Cup crispy rice cereal or pieces of tissue paper

Part 1: What Is This?

- Materials
- ☐ Activity Sheet
 - ☐ Large foam or plastic cup
 - ☐ Plastic tub or box full of water
 - ☐ PVC pipe
 - ☐ Wool or nylon cloth or sock

Teacher Instructions:

- Demonstrate static electricity (but don't say what you are doing or give hints about the topic):
 - Poke a hole in the bottom of the foam cup.
 - Set the cup in the plastic tub or box of water (enough water to fill the cup when the cup scoops up water).
 - Have a student hold the cup over the tub.
 - Rub the PVC pipe with the wool or nylon cloth.
 - Fill the cup with water from the tub and let the water drain out of the hole.
 - Move the pipe near the stream of water, then take it away. Move it back and forth so students can see what is happening.



Above is a photo of the movement of the water. We also took a video of the process that shows a better example. You can access it here: <https://youtube.com/MKThOLECgRw>

Engage

Part 2: My Experiences

Teacher Instructions:

- Show students the picture.
- Have students write their response to the pictures on their My Experiences with Static Electricity sheet.

Part 3: Introducing . . . Static Electricity

Materials List

- ☐ Introducing Static Electricity Activity Sheet
- ☐ Inflated balloon
- ☐ Piece of wool, nylon, or fur
- ☐ Plate or tray (any material except styrofoam)
- ☐ ½ Cup crispy rice cereal or pieces of confetti (Use a hole puncher with tissue paper.)

Teacher Instructions:

- Have students perform the activity with their group.
- Give students time to draw their observations on their Activity Sheets.
- Have a class discussion, in which students describe their observations. Write these down on the board or anchor chart duplicating the What I saw / What I think caused this / Experiment Ideas sheet.
- In groups, have students work together to write answers to questions 1 and 2.
- As a whole class, discuss questions 3 and 4. Elicit responses. Do not explain static electricity or vocabulary terms at this point. You want to use this time to discover your students' misconceptions.
- In groups, have students work together to answer questions 3 and 4. Encourage true brainstorming, in which all thoughtful answers are allowed.

Teacher Note:

This works best if it is not humid. Water attracts negative charges, so humidity allows static electricity to disperse quickly. When I did this on a humid day, I couldn't get enough static electricity to build up.

- Alternatives:
- A PVC pipe with a hole in the bottom
 - Make confetti

Engage

Part 3: Introducing . . . Static Electricity



Engage Part 2: My Experiences?



Engage Part 2: My Experiences with Static Electricity

- Describe what you see in the picture.

- What do you think caused this to happen?

- Has this ever happened to you? Describe how it felt.

Engage Part 3: Introducing . . . Static Electricity

What I saw:

What I think caused this:

Experiment Ideas:

Engage Part 3: Introducing . . . Static Electricity

- Pour the cereal on the tray or plate. Spread it around.
- Take the cloth and rub it on the balloon several times.
- Hold the balloon about 12 inches above the tray.
- Slowly move the balloon closer to the tray.
- Draw what happened on your Activity Sheet.
- Using complete sentences, describe what you saw.

When I moved the balloon close to the crispy rice cereal, this is what it looked like:

Wait for your teacher before you answer this question:

- What happened when the balloon was high above the cereal?

- What happened as the balloon moved closer to the cereal?

Wait for your teacher before you answer this question:

- Why do you think this happened?

Wait for your teacher before you answer this question:

- How can you find out why this happened? What sort of experiment could you do?

Each section has Teacher Background, Lesson Plans, Reflection and Student Resources. There are three parts to every section.

Static Electricity 5E Lesson Plans

Explore

Explore Teacher Background

The purpose of the *Explore* section of the 5E instructional model is to allow students to **explore the new topic and gather information about it**. In this section, students are given the opportunity to think creatively and build science skills.

The role of the teacher is to encourage students to work together to **make discoveries and form explanations**. Using probing questions, the teacher facilitates discovery and hypothesis-formation. The students collaborate to test ideas and revise hypotheses as they go along. Using their prior knowledge and best guesses about current experiences, **students will begin to form hypotheses and make models to explain scientific concepts**.

Students are still in the **discovery** phase. They are putting to the test their own ideas about themselves why their misconceptions are true. **teaching about the vocabulary and concepts** and encouraging "wonder" statements, and encouraging

You do not have to do all three activities. If you need to shorten the section, you can choose to do Part I of this section. If you choose to do all three, students will thoroughly explore why static electricity occurs to reach all learning styles with the

While the following activities were designed to be proper "Exploration" in the 5E framework, they can be used as well. The *Force and Motion* section can be used to extend this section.

*Part 1: "Check It Out"
Part 2: "Watch and Read This"
Part 3: "You Try It"

Explore

Objectives

- Students will work together to investigate static electricity. They will do this by observing static charges on a balloon.
- Students will gather very general information about factors that affect static electricity.
- Students will use observations and information to make a hypothesis about how to discharge static electricity from a balloon.
- Students will plan an investigation and test their hypothesis.

Duration

- Part 1 (Check It Out): 20 minutes
- Part 2 (Watch and Read This): 15 minutes
- Part 3 (You Try It): 20 minutes

Part 1: Check It Out

Materials

- ☐ Tray or plate
- ☐ 1 tsp mixture of table salt and ground black pepper
- ☐ Inflated balloon
- ☐ Wool or Nylon cloth
- ☐ Activity Sheet

Teacher Instructions

See Student Instructions on the Activity Sheet.

Part 2: Watch and Read This

Teacher Instructions

Show this video to the students and have take notes: <https://www.youtube.com/watch?v=6YcBJY29Ju4>

If you would like to make your own Van de Graaff generator out of simple and inexpensive materials, this video has instructions: <https://www.youtube.com/watch?v=pARaQlaDKel>

Explore

Part 3: You Try It

Materials

- ☐ Tray
- ☐ Crispy rice cereal
- ☐ Ruler
- ☐ Inflated balloon
- ☐ Pieces of nylon, silk, wool, and/or fur
- ☐ Cotton Cloth
- ☐ Dryer sheet
- ☐ Plastic wrap
- ☐ Sheet of aluminum foil
- ☐ Optional: polyester or vinyl material
- ☐ Check It Out Activity Sheet
- ☐ You Try It Activity Sheet

Teacher Instructions

Students are going to combine their experience with some general information on what allows static electricity to be discharged from an object. They will discharge static from a balloon. We do not want them to become charged. They have not formally learned about static electricity. The purpose of this section is to allow them to use their prior knowledge, unpack what they know, and hone their skills in using the scientific method.

Teacher Note: If it is very humid, it is difficult to get a static charge. Use lighter-weight material, such as tiny pieces of rice cereal.

Explore

Part 2: Watch and Read This: Activity Sheet

How to Avoid Static Electricity	Notes
From the video:	What should you wear to avoid a static shock?
1. <u>Wear cotton clothes.</u> Natural materials are low-static materials.	
2. <u>Wear leather-soled shoes or go barefoot indoors.</u> Synthetic (human-made) materials make a static charge.	What can you touch to avoid static electricity?
3. <u>Touch wood or concrete.</u> These do not build up a static charge. If you touch metal, water, or a person, you might get a shock.	How can adding water to the air help?
4. <u>Put water in the air.</u> If you put out a bowl of water or a humidifier, it will put water in the air. There is more buildup of static charge in dry air.	What can you do to the car?
5. <u>Rub a dryer sheet on car seats.</u> The chemicals in the dryer sheet prevent static shock.	How can a key help?
6. <u>Touch the metal on a car.</u> This helps get rid of the static charge in your body.	
7. <u>Touch a key to a metal object.</u> This gets rid of the static charges so there won't be a shock.	

Explore

Part 1: Check It Out: Activity Sheet

Name: _____

Student Instructions:

- Pour the salt and pepper mixture onto the plate.
- Rub the balloon several times with the cloth.
- Hold up the ruler next to the balloon.
- Hold the balloon above the ruler over the plate.
- Slowly move the balloon closer to the plate. Watch the mixture carefully. As soon as it begins to move, look at the ruler.
- Write down the height of the balloon when the mixture begins to move.
- Hold the balloon as close as you can above the mixture on the plate without touching it.
- Look at what sticks to the balloon.
- Record your observations.

The balloon was _____ inches away when the mixture first began to move.

When the balloon was very close, _____ stuck to the balloon.

Explore

Part 3: You Try It: Activity Sheet

Name: _____

Student Instructions:

- Look at the results on your Check It Out Activity Sheet. Look at your notes on your Read About It Sheet.
- You will have a charged balloon. Your goal is to keep the balloon from picking up any crispy rice cereal. You will do this by taking away the charge from the charged balloon.
- Decide with your partner(s) how you might do this. You may use any of the materials your teacher gives you.
- In a hypothesis, write what you can do to take the charge away from the balloon.
- Pour the cereal into the tray.
- Rub the cotton cloth on the balloon. It is now charged.
- Test your hypothesis.
 - You can change your hypothesis as you go along. Record these changes on your Activity Sheet.

Trial 1:

Hypothesis: I think _____ will take away the charge from the balloon. I think this because _____

Observation: _____

Draw or describe what happened when you tested your hypothesis. How much cereal did the balloon pick up? _____

Explore

Part 2: Watch and Read This: Activity Sheet

Name: _____

How to Avoid Static Electricity	Notes
From the video:	
1. <u>Wear cotton clothes.</u> Natural materials are low-static materials.	
2. <u>Wear leather-soled shoes or go barefoot indoors.</u> Synthetic (human-made) materials make a static charge.	
3. <u>Touch wood or concrete.</u> These do not build up a static charge. If you touch metal, water, or a person, you might get a shock.	
4. <u>Put water in the air.</u> If you put out a bowl of water or a humidifier, it will put water in the air. There is more build-up of static charge in dry air.	
5. <u>Rub a dryer sheet on car seats.</u> The chemicals in the dryer sheet prevent static shock.	
6. <u>Touch the metal on a car.</u> This helps get rid of the static charge in your body.	
7. <u>Touch a key to a metal object.</u> This gets rid of the static charges so there won't be a shock.	

Explore

Part 3: You Try It: Activity Sheet

Name: _____

Trial 2:

Hypothesis: I think _____ will take away the charge from the balloon. I think this because _____

Observation: _____

Draw or describe what happened when you tested your hypothesis. How much cereal did the balloon pick up? _____

Trial 3:

Hypothesis: I think _____ will take away the charge from the balloon. I think this because _____

Observation: _____

Draw or describe what happened when you tested your hypothesis. How much cereal did the balloon pick up? _____

If you could use a material that was not offered to you, what would you use? Why? _____

Each section has Teacher Background, Lesson Plans, Reflection and Student Resources. There are three parts to every section.

Static Electricity 5E Lesson Plans

Explain

Four options for note taking.

Explain Teacher Background

The purpose of the *Explain* section of the 5E instructional model is to allow students to analyze their findings from the Explore station and to begin making explanations and observations. Students are able to analyze their findings and listen critically to explanations.

Once this has taken place, the teacher and/or reading sections provide formal scientific concepts, vocabulary, and skills. Students analyze their processes and corrections where needed. The teacher leads the students into correct explanations.

You do not have to do all three vocabulary. If you need to show do Part 2. If you choose to do thorough explanation in true student-led, rather than teacher-led.

While the following activities are proper 'Explanation' in the 5E activities and reading selection. Set has more activities and resources.

Part 1: "What Does It Mean?"
*Part 2: "What Is Static Electricity?"
Part 3: "Putting It All Together"

Explain

- Objectives**
- Students will work collaboratively to determine what types of materials are better at removing static electricity.
 - Students will listen to the teacher's explanation about static electricity.
 - Students will use the new information to revise their explanations about the factors that affected static electricity.
 - Students will draw a diagram to show that they understand the flow of electrons in static electricity.
- Duration**
- Part 1 (What It Means?) 10 minutes
 - Part 2 (What Is Static Electricity?) 20 minutes
 - Part 3 (Putting It All Together) 10 minutes

Part 1: What Does It Mean?

Materials

- ☐ Your Try It Activity Sheet (from Explore)
- ☐ What Does It Mean? Activity Sheet

Teacher Instructions

In this Double Think-Pair-Share activity, students share their experiences from the Explore station and reflect on what they learned. At this stage, they are still processing the information. In Part 2, you will provide more information.

In a Double Think-Pair-Share activity, students share their answers to them on the Activity Sheet. After changing their responses. After with their new partner. Again, the teacher leads the students into correct explanations.

Explain

Part 1: What Does It Mean?

As students discuss the questions on the Activity Sheet, circulate through the classroom. Discussion is respectful and that all students have a chance to provide input. Encourage them to use their experiences and observations in the previous activity to help them find answers to the questions.

Have students share their answers with the class. Elicit answers in a brainstorming session on the board or adding sticky notes to the projected worksheet. This can then be a discussion point at the end of Part 3 of this Explain section.

Part 2: What is Static Electricity?

- Materials**
- ☐ Article/Note-taking sheet
 - ☐ Sum It Up exercise

Teacher Instructions

In this section, students learn the key concepts, vocabulary, and scientific knowledge in order to understand this topic. You have flexibility in how you implement this section.

We are offering two options for students to read a paragraph and highlight on sentence.

Alternatively, you can have students about key concepts.

A second section of the margin to give students a chance to write.

A third section was added for them to read the text.

There is a "Sum It Up" section for students to reflect on what they learned.

Explain

Part 3: Putting It All Together: Activity Sheet

- Student Instructions:**
- Look your results on the "You Try It" Activity Sheet.
 - You and your partner(s) will investigate static electricity. Together, decide which materials will build up the most charge on the balloon. The material that picks up the most charge is the one that builds up the most charge.
 - Work together with your partner(s) to make a hypothesis.
 - You may use anything your teacher gives you, as well as your hand and your partner's hand.
 - Put the cereal into the tray.
 - Rub the material on the balloon. It is now charged.
 - Test your hypothesis.
 - Move the balloon to the tray so that it picks up cereal.
 - Move the balloon over to the other tray and wipe off the cereal.
 - Count the number of pieces of cereal and write this down on your Activity Sheet.
 - You can change your hypothesis as you go along. Record these changes on your Activity Sheet.

Trial 1:

Hypothesis: I think _____ will pick up the most pieces of cereal. I think this because _____.

Observation:

Draw or describe what happened when you tested your hypothesis.

How much cereal did the balloon pick up?

Explain Part 2: What is Static Electricity? Article

Name: _____

What happened in this picture?

This girl went down the slide. As she was sliding, her hair stuck straight out. This was caused by static electricity.

Static electricity happens when electrons build up on an object. All objects are made of atoms. Atoms are the smallest parts of matter (objects). They are the building blocks of all objects.

Atoms have small parts called particles. Electrons and protons are two particles in atoms. Electrons have a negative charge. Protons have a positive charge. In most atoms, there are the same number of protons and electrons. There are the same number of positive and negative charges. This makes the charges in the atom balance out. It has no charge.

The number of electrons in an atom can change. An atom can lose electrons. If then has more protons than electrons. This gives the atom a positive charge.

An atom may gain electrons. Now the atom has more electrons than protons. The atom is negatively charged.

Opposite charges are attracted to each other. This means they move toward each other. Positive charges move toward negative charges. Negative charges move toward positive charges.

Some things have the same charge. They repel each other. This means they move away from each other. A positively charged object will move away from another positively charged object.

When objects are rubbed quickly, they may lose electrons. The electrons flow to the thing that rubs it. This is how static electricity builds up.

Lighting is caused by static electricity. Inside a storm cloud, small pieces of ice move up and down very fast. They rub against each other as they move. The pieces of ice that are moving up lose some electrons. These electrons flow to the pieces of ice that are moving down. Now the bottom of the cloud is negatively charged.

The things on the ground have an equal number of positive and negative charges. The negative charges in the cloud are attracted to the positive charges on the ground. This is a very large attraction. The negative charges get released very fast. They are released as a lightning bolt.

Static electricity is all around us. You can get shocked when you get out of the car, walk across the floor, or get your dog. You see static electricity when you see a lightning bolt. You can even hear it sometimes! Next time you go down a slide and your hair stands up, you will know that you have static electricity running through your body.

Diagram: A diagram showing an atom with a central nucleus containing protons (+) and neutrons (0). Electrons (-) are shown orbiting the nucleus. Arrows indicate attraction between opposite charges and repulsion between like charges.

Explain Part 2: What is Static Electricity? Article

Name: _____

What happened in this picture?

Some things are better at giving up electrons. This includes dry skin and leather, fur and hair, nylon and wool. When these things are rubbed, they lose electrons. They become positively charged.

Some things are better at giving up electrons. This includes dry skin and leather, fur and hair, nylon and wool. When these things are rubbed, they lose electrons. They become positively charged.

This is what happened to the girl on the slide. The girl slid down the plastic slide. Her parts rubbed the slide. The slide took the electrons from her parts.

The slide is now negatively charged. The girl is positively charged. Even her hair became positively charged. The charges repelled each other. They pushed away from each other. This made each strand of hair move far away from the other strands.

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Name: _____

What happened in this picture?

Some things are better at giving up electrons. This includes dry skin and leather, fur and hair, nylon and wool. When these things are rubbed, they lose electrons. They become positively charged.

Some things are better at giving up electrons. This includes dry skin and leather, fur and hair, nylon and wool. When these things are rubbed, they lose electrons. They become positively charged.

This is what happened to the girl on the slide. The girl slid down the plastic slide. Her parts rubbed the slide. The slide took the electrons from her parts.

The slide is now negatively charged. The girl is positively charged. Even her hair became positively charged. The charges repelled each other. They pushed away from each other. This made each strand of hair move far away from the other strands.

Lighting is caused by static electricity. Inside a storm cloud, small pieces of ice move up and down very fast. They rub against each other as they move. The pieces of ice that are moving up lose some electrons. These electrons flow to the pieces of ice that are moving down. Now the bottom of the cloud is negatively charged.

The things on the ground have an equal number of positive and negative charges. The negative charges in the cloud are attracted to the positive charges on the ground. This is a very large attraction. The negative charges get released very fast. They are released as a lightning bolt.

Static electricity is all around us. You can get shocked when you get out of the car, walk across the floor, or get your dog. You see static electricity when you see a lightning bolt. You can even hear it sometimes! Next time you go down a slide and your hair stands up, you will know that you have static electricity running through your body.

Diagram: A diagram showing an atom with a central nucleus containing protons (+) and neutrons (0). Electrons (-) are shown orbiting the nucleus. Arrows indicate attraction between opposite charges and repulsion between like charges.

Explain Part 2: What is Static Electricity? Article

Name: _____

What happened in this picture?

Some things are better at giving up electrons. This includes dry skin and leather, fur and hair, nylon and wool. When these things are rubbed, they lose electrons. They become positively charged.

Some things are better at giving up electrons. This includes dry skin and leather, fur and hair, nylon and wool. When these things are rubbed, they lose electrons. They become positively charged.

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Diagram: A diagram showing an atom with a central nucleus containing protons (+) and neutrons (0). Electrons (-) are shown orbiting the nucleus. Arrows indicate attraction between opposite charges and repulsion between like charges.

Explain Part 3: Putting It All Together: Activity Sheet

Name: _____

Trial 2:

Hypothesis: I think _____ will pick up the most pieces of cereal. I think this because _____.

Observation:

Draw or describe what happened when you tested your hypothesis.

How much cereal did the balloon pick up?

Trial 3:

Hypothesis: I think _____ will pick up the most pieces of cereal. I think this because _____.

Observation:

Draw or describe what happened when you tested your hypothesis.

How much cereal did the balloon pick up?

If you could use a material that was not offered to you, what would you use? Why?

Explain Part 3: Putting It All Together: Activity Sheet

Name: _____

Which material picked up the most pieces of cereal?

Draw a picture of the material rubbing the balloon. Show where the positive charges are and where the negative charges are.

If you could use a material that was not offered to you, what would you use? Why?

Explain Part 3: Putting It All Together: Activity Sheet

Name: _____

Which material picked up the most pieces of cereal?

Draw a picture of the material rubbing the balloon. Show where the positive charges are and where the negative charges are.

If you could use a material that was not offered to you, what would you use? Why?

Explain Part 3: Putting It All Together: Activity Sheet

Name: _____

Which material picked up the most pieces of cereal?

Draw a picture of the material rubbing the balloon. Show where the positive charges are and where the negative charges are.

If you could use a material that was not offered to you, what would you use? Why?

There are three parts to every section.

❖ Just the text
❖ Two-column
❖ Two-column with questions
❖ Fill-in-the-blank while listening to text read aloud

Static Electricity 5E Lesson Plans

Extend

Extend Teacher Background

The purpose of the *Extend* section of the 5E instructional model is to **elaborate on the instruction and the learning** that has taken place so far.

In this section, the teacher facilitates the broadening of student understanding. This is done by providing opportunities for **students to analyze their findings from the Explore station and to begin making explanations of their observations**. In this way, students **apply what they have learned to concepts, vocabulary, and skills in other situations**. Students are able to generalize the information, extending their learning to situations beyond those introduced in the activities, examples, and lessons.

After students have completed a self-reflection, the teacher facilitates the broadening of student understanding. This is done by providing opportunities for **students to analyze their findings from the Explore station and to begin making explanations of their observations**. In this way, students **apply what they have learned to concepts, vocabulary, and skills in other situations**. Students are able to generalize the information, extending their learning to situations beyond those introduced in the activities, examples, and lessons.

You do not have to do all three activities. You choose to do all three activities or you choose to do one or two. Additionally, these three different types of activities can be used in a variety of ways.

While the following activities were designed to be used in a 5E framework, they can be used in a variety of ways. Set has more activities and reading selections as well.

*Part 1: "Where is the Charge?"

*Part 2: "Show What You Know"

Part 3: "Forces Fun"

*If you can't do

Extend

Objectives

- Students will apply what they have learned about static electricity to a new situation.
- Students will deepen their understanding of static electricity, gaining a more generalized knowledge of this specific scientific concept.
- The teacher will resolve all persisting student misconceptions about static electricity.

Duration

- Part 1 (Where is the Charge?): 15 minutes
- Part 2 (Show What You Know): 15 to 45 minutes
- Part 3 (Forces Fun): 15 minutes

Materials

- Acrylic paint
- Optional: Colored pencils (for the diagrams)

Part 1: Where's the Charge?

Materials

- Where is the Charge? Activity Sheet
- Optional: Colored pencils (for the diagrams)

Teacher Instructions

Consider playing "Sage and Scribe" to complete this activity.

- Pair off students (teacher as Sage and Scribe).
- One student starts out as Sage and the other as Scribe.
- The Sage will "teach" the Scribe the concepts of static electricity, as much as possible to answer the questions.
- Each student will switch roles and teach the other.
- Optional: Project the work on the board.

Extend Part 1: Where is the Charge? Activity Sheet

- A wool cloth is rubbed on the balloon. Electrons flow from the cloth to the balloon. Draw this. Label the cloth and balloon. Show the positive and negative charges.
- The balloon is now charged. It moves close to small pieces of paper. The paper is attracted to the balloon. Draw this. Label the paper and balloon. Show the positive and negative charges.
- You walk across the carpet in your socks. Electrons flow from the carpet into your body. Draw this. Label yourself and the carpet. Show the positive and negative charges.
- You touch your friend. There is a shock. Why is there a shock? Draw this. Label the yourself and your friend. Show the positive and negative charges.

Extend Part 2: Show What You Know - Static Games

Materials

- Stopwatch/Timer
- Soda can (empty, clean, and dry)
- 2 Balloons, inflated and tied off
- Nylon, wool, or animal fur cloth
- 2 Large foam plates
- 2 Small foam plates
- Yardstick
- 2 PVC pipes
- 2 Plastic bags (disposable grocery bags made out of thin plastic are best)

Teacher Instructions

You have three options for this section.

- The students do all the activities.
- You choose one activity for all students to do.
- Different groups of students to different activities. You may need to assign students to different groups for this. Each student group could take a video of themselves doing the activity and bring it back to the class.

Extend Part 2: Show What You Know: Soda Can Race

Student Instructions - Soda Can Race:

- Assign group roles:
 - Timekeeper: Uses the stopwatch to keep track of the time.
 - Recorder: Writes down each Racer's racing time.
 - 2 Racers: Use the balloons to race the cans to the finish line.
- Lay the cans down on the starting line, side-by-side.
- At the Timekeeper's "Go" the Racers will begin:
 - Each Racer rubs the cloth on the balloon.
 - Each Racer uses the balloon to "pull" the can across the finish line.
- You **may** recharge your balloon by rubbing it with the cloth. You **may not** touch the can to make it move.
- The Timekeeper says how long it took for each Racer to cross the finish line.
- The Recorder writes down these times.

Racer A:	Racer B:
Time to cross the finish line:	Time to cross the finish line:

What happened? Why did the cans move?

Include a picture in your answer.

Extend Part 2: Show What You Know: Flying Plates

Student Instructions - Flying Plates:

- Assign group roles:
 - Judge: Decides which plate flew the fastest.
 - Recorder: Writes down how far the plates flew.
 - 2 Flyers: Use the plates to see how far they can fly.
- Place the **large foam plates** upside down on a table, next to each other.
- The Flyers rub the bottom of their **small foam plates** with their cloth.
- The Judge tells the Flyers when to go.
- The Flyers bring the small plates, bottom side down, near the large plate. The large plate will fly away, let go.
- Using the yard stick, the Judge decides which plate flew farthest away.
- The Recorder writes down these distances.

Flyer A:	Flyer B:
Distance plate flew:	Distance plate flew:

What happened? Why did the plate fly away?

Include a picture in your answer.

Extend Part 3: Have Fun With It

Student Instructions:

- Each student has one quiz card.
- Students walk around holding the card in their left hands and holding their right hands in the air.
- When the teacher says "Quiz," students stop. They high-five the person standing nearest to them.
- Partner A asks the question. Partner B answers. If needed, Partner A can gently coach Partner B to find the right answer.
- Partners switch roles.
- After both partners ask and answer questions, they trade cards.
- Both partners raise their right hands and find a new person to high-five.

Q: What happens to the charges in a person when they slide down a slide?

A: Charges

Q: How does an atom get a positive charge?

A: It loses

Q: What happens when objects are rubbed quickly?

A: They make

Q: What causes lightning?

A: Static electricity

Q: When the negative charges build up in a thundercloud, what happens?

A: They are attracted to the positive charges on the ground. They get released as lightning.

Q: You rub a balloon with a cloth. You bring the balloon near a soda can. The can moves toward the balloon. What made this happen?

A: The negative charges on the balloon attracted the positive charges on the can.

Q: You rub a PVC pipe with a cloth. You bring the pipe near a plastic bag. The bag flies away from the pipe. What made this happen?

A: The negative charges on the pipe repelled the negative charges on the bag.

Q: You rub a PVC pipe with a cloth. You bring it near a stream of water. The water bends toward the pipe. What made this happen?

A: The negative charges on the pipe attracted the positive charges in the water.

There are three parts to every section.

Static Electricity 5E Lesson Plans

Evaluate

Evaluate Teacher Background

The purpose of the *Evaluate* section of the 5E instructional model is for students to **demonstrate their understanding of concepts and vocabulary**. Students will also demonstrate the skills they've developed in this unit.

The role of the students is to learn. Teachers **informally** address misconceptions have been dealt with students.

You do not have to do all three to shorten the amount of time along with the unit test found activities with the class, it is more about this topic, gaining a much you will also be able to reach all

While the following activities will proper "Evaluation" in the 5E model.

*Part 1: "What I Know"
Part 2: "Showing Charges"
Part 3: "Going Forward"

There are three parts to every section.

Evaluate

Part 2: Showing Charges

Materials

For Performance Assessment:

- ☐ Plate with a mixture of table salt and ground black pepper
- ☐ 2 Balloons
- ☐ 2 PVC pipes
- ☐ Nylon, wool, or animal fur
- ☐ Plastic cling wrap
- ☐ Glass Bowl
- ☐ Showing Charges Performance Assessment Sheet

For Worksheet Activity:

- ☐ Showing Charges Worksheet Assessment

Teacher Instructions:

The purpose of Part 2 of this section is for students to physically demonstrate mastery of what they have learned. You have two options for this section. The Performance Assessment is optimal, but it also takes the most time. If you are short on time, the Worksheet Activity will be useful.

For the Performance Activity, there are several ways students may demonstrate mastery. One idea is to have them record a video of each scenario. Another idea is to have parents or classroom aides help you observe the demonstrations and check off the mastery. Finally, you can do this on your own, having students complete the first column of their sheet (drawing their set-ups). They can complete the formal assessments in Part 3 of this section while they wait for you to come to their group.

Have the materials on a tray for students to use to demonstrate mastery.

Optional: Go over the answers with the whole class.

Evaluate

Objectives

- Students will evaluate their own understanding of static electricity.
- Students will be able to demonstrate knowledge of the concepts and vocabulary.
- The teacher will encourage students to ask questions that could lead to future investigations.

Duration

- Part 1 (What I Know): 15 minutes
- Part 2 (Showing Charges): 10 minutes per student (total time depends on how this is run in the classroom)
- Part 3 (Going Forward): 20 minutes

Materials for all three parts:

- ☐ Activity Sheets
- ☐ "What I Know" Rubric
- ☐ Plate with a mixture of black pepper
- ☐ 2 Balloons
- ☐ 2 PVC pipes
- ☐ Nylon, wool, or animal fur
- ☐ Plastic cling wrap
- ☐ Glass Bowl
- ☐ "Showing Charges" Performance Assessment Sheet

Part 1: What I Know

Materials

- ☐ "What I Know" Activity Sheet
- ☐ "What I Know" Self-Check

Teacher Instructions

Students will work on this part individually. When they have answered the questions, assess their understanding of the concepts using the rubric. If your students are using the rubric, you may want to practice together with the class.

Alternative: If writing is challenging for students, have them do the pictures.

placed the

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Optional: D

want to inv

Evaluate

Part 3: Going Forward

Materials

- ☐ "Going Forward" Activity Sheet

Teacher Instructions:

Having students think about what they know and consider what tool in solidifying and generalizing the knowledge they have acquired. Students will hypothesize an answer to a question they have. to find answers to the question.

If your students have difficulties coming up with questions, you can such as:

What makes _____

Why does _____ cause _____

Optional: Have students share their responses with the class.

Post-Lesson Teacher Reflection

Things you want to remember for next time:

Evaluate

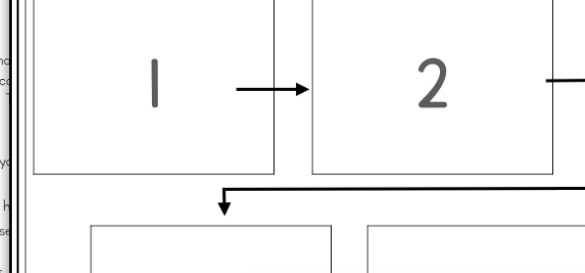
Part 1: What I Know: Activity Sheet

Answer these questions. When you are finished, check your learning by using the rubric.

Key Words: Static electricity, Negative charge, Positive charge, Electron, Attract

Look at these pictures. Decide the order they go in. Cut them out and place them in the boxes.

Do not glue them at this point.



Evaluate

Part 1: What I Know: Activity Sheet Im



Write what happened. Use Key Words.

Evaluate

Part 1: What I Know: Self-Check

Name: _____

To use the rubric:

- Underline or highlight the sentence that has the same amount of information as your answer. The words don't have to be exactly the same.
- Decide if you have mostly 1's, 2's, or 3's. Write this score at the bottom.
- Rewrite your answers to match statements from the 3 row.

Rubric

Score	Question
3	Electrons from the carpet flowed into the boy.
	The boy has static electricity in his body.
	The negative charges are attracted to positive charges in the second boy.
2	The static electricity (or negative charge) is released in a zap (or shock).
	The boy picked up negative charges (or electrons) from the carpet.
	This is static electricity.
1	Negative charges flowed into the second boy.
	He zapped (or shocked) the second boy.
	The boy has static electricity.

Rewrite your answers:

- Glue the pictures in their correct order.
- Write what happened. Use Key Words in your answer.

Evaluate

Part 2: Showing Charges: Performance Assessment

Student Instructions (Performance Assessment):

- Read each statement.
- Discuss with your group how you might show what is happening in the statement.
- You may use any of the materials provided.
- Draw a picture or write a sentence telling how you will show what is happening in the statement.
- Your teacher will tell you how you will demonstrate this.

Statement to Show	Draw or write how you will show this.	Was the statement demonstrated? Teacher Only
Pepper is attracted to charges. Salt is not.		Yes / No
A mixture of salt and pepper can be separated.		Yes / No
Plastic wrap gains negative charges. Glass loses negative charges.		Yes / No
Two things with extra negative charges will repel each other.		Yes / No

Evaluate

Part 2: Showing Charges: Worksheet Assessment

Name: _____

Student Instructions: Draw a picture to match each statement

This is a way to pick up charges in your body.	Plastic wrap gains negative charges. Glass loses negative charges.
Storm clouds build up negative charges in them. They are attracted to positive charges on the ground.	Plastic bags can gain negative charges. They are repelled by things that have negative charges.

Evaluate

Part 3: Going Forward: Activity Sheet

Name: _____

Question: Think about what you have learned about electrical charges. You have learned that some things are better at gaining electrons and some are better at losing electrons. You have learned that opposite charges attract and like charges repel. Sometimes, the attraction causes a zap or lightning. But is there more to learn about electrical charges? Yes!

Think about how charges flow. What is the next thing you would like to learn about?

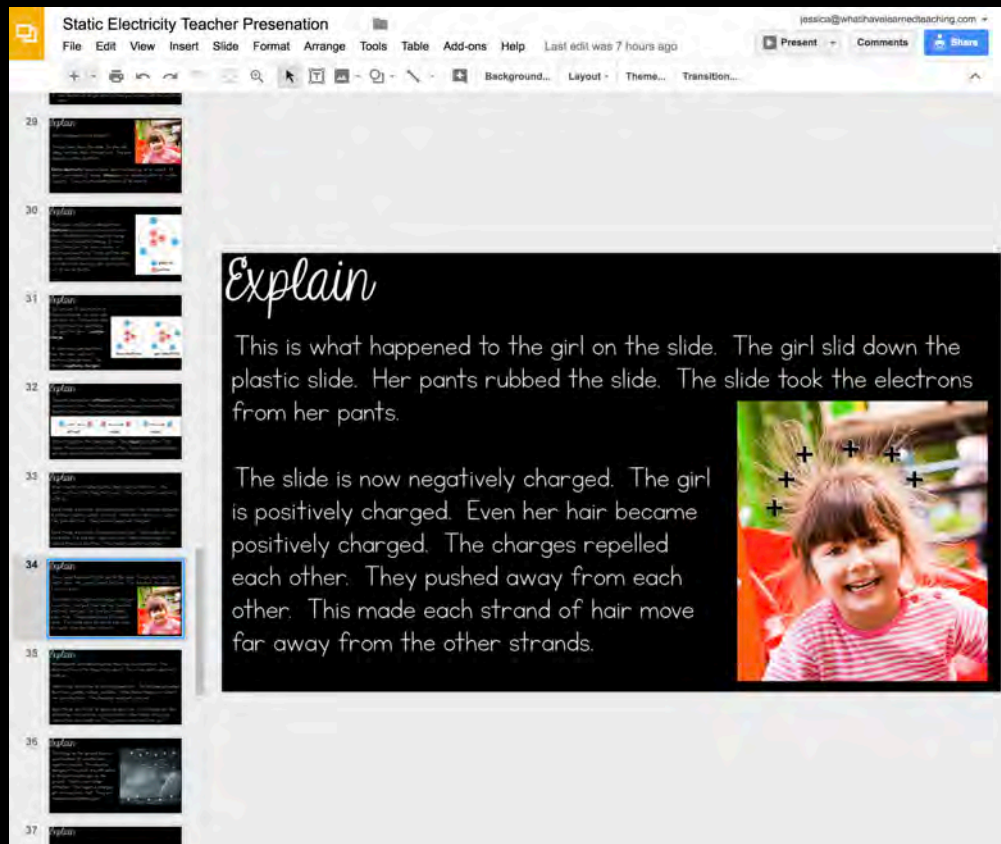
My question about electrical charges:

Hypothesis: What is your guess? Use what you know about electrical charges. Make a hypothesis about this. A hypothesis is a guess based on what you know. My hypothesis is:

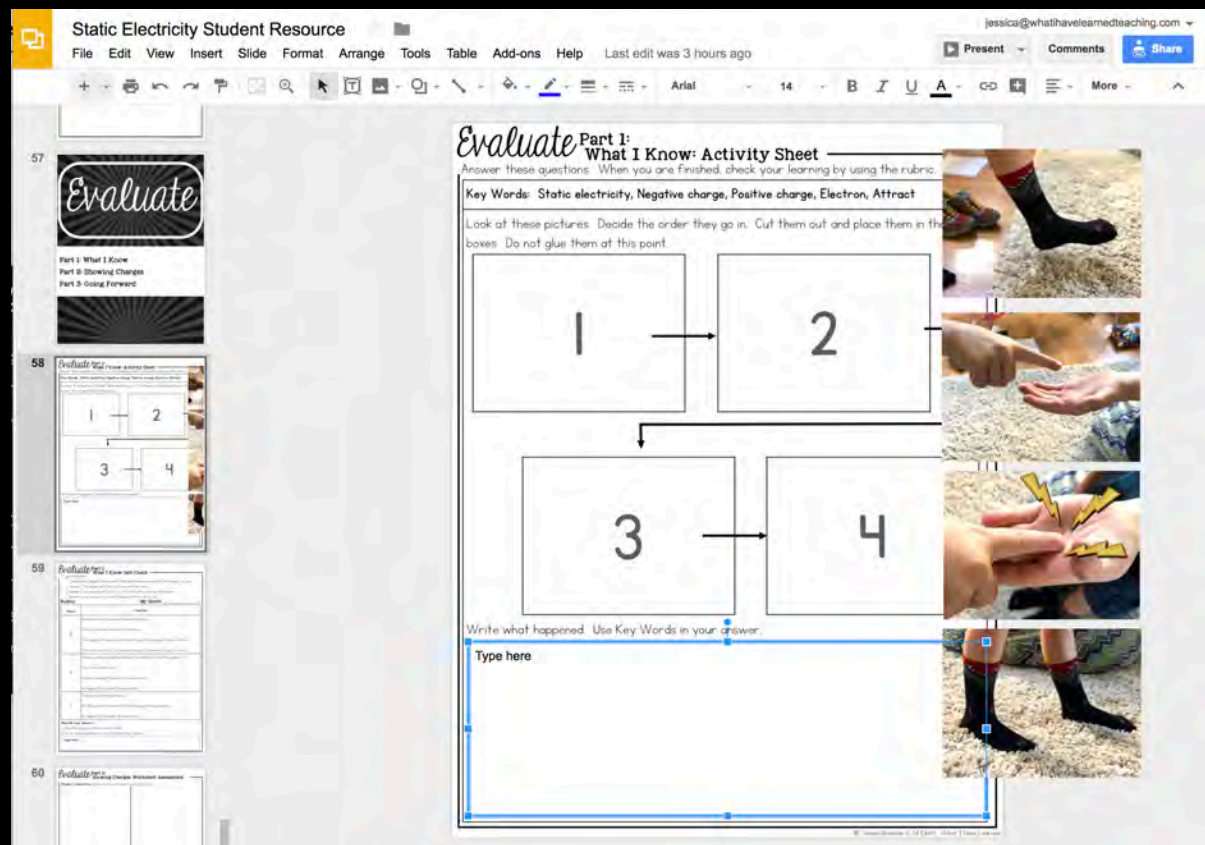
Experiment: Plan an experiment. How would you answer this question? Write the steps in the experiment:

Draw how you would set up your experiment:

Teacher Presentation



Student Sheets



FREE Google Slides & Form Resources

The Teacher Presentation is available as a Google Slide Presentation. It can help you present the content to students and engage them with colorful photos and directions.

The Student Sheets are available in Google Slides and provide a paperless option. Not all of the student sheets lend themselves to a paperless option as students are asked to draw some things. Use the slides that work best for your classroom and students.

The Exit Cards are available in a Google Forms.

A screenshot of a Google Form titled "Static Electricity 5E Unit Exit Slips". The form is divided into two sections. Section 1 of 5 is titled "Static Electricity 5E Unit Exit Slips" and includes a "Form description" section. Section 2 of 5 is titled "Answer the following questions" and includes a "Description (optional)" section. The form also includes a "TEACHER NOTES" section with instructions on how to use the form and a "Student Name" field with a "Short answer text" input.

SE

Static Electricity Science Unit Plan

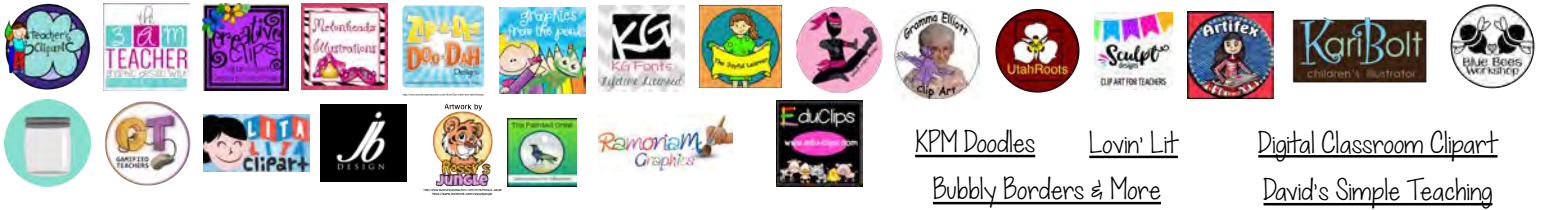


3rd grade

Jessica Boschen & Jill Elliott

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WHAT I have
LEARNED



WORD PROBLEMS	CURRICULUM MAP TEMPLATE	ADDITION & SUBTRACTION
This is perfect for teachers whose students struggle solving word problems. Have you ever thought of removing the numbers from word problems? Great for first and second grades.	Do you struggle with long range planning? This curriculum map template will get you started on planning for your whole year!	Two-digit addition and subtraction can be tricky for students. Here is a sample of resources to help them explore different models and strategies.
Name Email* Grade (choose the best fit) YES! I WANT IT!	Name Email* What Grade Do You Teach? * YES! I WANT IT!	Name Email* Grade (choose the best fit) YES! I WANT IT!

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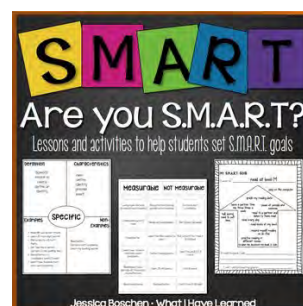
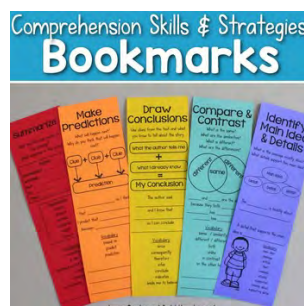
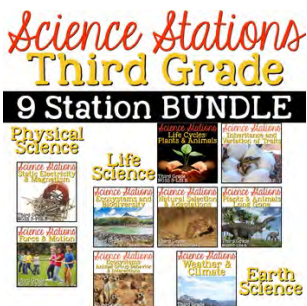


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5E Section	Objectives	Duration	Page
Teacher Notes / Common Misconceptions / Materials / Timeline			4
Vocabulary Cards & Big Idea Posters			10
Exit Tickets			28
Engage	- Students will access their prior knowledge about static electricity. - Student interest in static electricity will be sparked (pun intended). - The teacher will be able to identify student misconceptions about static electricity.	- Part 1 (What Is This?): 10 minutes - Part 2 (My Experiences): 10 minutes - Part 3 (Introducing): 20 minutes	78
Explore	- Students will work together to investigate static electricity. They will do this by observing static charge on a balloon. - Students will gather very general information about factors that affect static electricity. - Students will use observations and information to make a hypothesis about how to discharge static electricity from a balloon. - Students will plan an investigation and test their hypothesis.	- Part 1 (Check It Out): 20 minutes - Part 2 (Watch and Read This): 15 minutes - Part 3 (You Try It): 20 minutes	90
Explain	- Students will work collaboratively to determine what types of materials are better at removing static electricity. - Students will listen to the teacher's explanation about static electrons. - Students will use the new information to revise their explanations about the factors that affected static electricity. - Students will draw a diagram to show that they understand the flow of electrons in static electricity.	- Part 1 (What Does It Mean?): 15 minutes - Part 2 (What Is Static Electricity?): 20 minutes - Part 3 (Putting It All Together): 20 minutes	100
Extend	- Students will apply what they have learned about static electricity to a new situation. - Students will deepen their understanding of static electricity, gaining a more generalized knowledge of these specific scientific concepts. - The teacher will resolve all persisting student misconceptions about static electricity.	- Part 1 (Where is the Charge?): 15 minutes - Part 2 (Show What You Know): 15 minutes to 45 minutes - Part 3 (Have Fun With It): 15 minutes	126
Evaluate	- Students will evaluate his or her own understanding of static electricity. - Students will be able to demonstrate knowledge of the concepts and vocabulary. - The teacher will encourage students to ask questions that could lead to future investigations.	- Part 1 (What I Know): 15 minutes - Part 2 (Showing Charges): 10 minutes per student - Part 3 (Going Forward): 20 minutes	147

Teacher Notes

Static Electricity

5E Instructional Model

This Static Electric Lesson Plan is an inquiry-based unit using the 5E Instructional Model. The 5E Model is student-led, with the teacher acting mainly as the facilitator. Through open-ended questions, real-life experiences, guided investigations, and research, the students gain a deep understanding of the scientific topics that are covered in the lessons. Each stage of the model serves as a foundation to the next, creating a coherent model that frames lessons, activities, and units.

The 5 E's of this method are as follows:

Engagement: Student interest is engaged. They ponder everything they already know about a topic. The teacher identifies any misconceptions at this point.

Exploration: Students explore the topic through hands-on activities. They gain experience with the topic and reflect more on what they know and experience with their classmates. The teacher continues to guide by asking open-ended questions.

Explanation: Students connect prior knowledge to experiences in the exploration. The teacher explains the concepts, and students draw conclusions about their investigations.

Exploration: Students take their new knowledge and apply it to novel situations. The teacher poses new questions and provides opportunities for students to investigate answers to them. This is when knowledge about specific topics begin to be generalized and deepened.

Evaluation: Students evaluate their learning process. They are able to prove what they know by performance, informal, and formal assessment. The teacher uses multiple forms of assessment to evaluate the students.

For more information on the 5 E's, [read the blog post series on 5E Instruction](#). We explain why we chose to use the 5E method of instruction and provide an in-depth explanation of each stage of the model.

Google Sheets Resources

Create a copy of these Google resources to use in your own Google Account:

To access the **Google Sheets Teacher Presentation**, use this link: REMOVED

To access the **Google Sheets Student Resource**, use this link: REMOVED

Teacher Notes

Static Electricity

Next Generation Science Standards

Next Generation Science Standards are written to be “Three Dimensional.” The following section explains how this set of science stations addresses the three dimensions of Performance Expectation, Disciplinary Core Idea, and Science and Engineering Practices/Crosscutting Concepts.

In Third Grade, students are expected to demonstrate understanding in the following Performance Expectation:

- **3-PS2-3.** Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

This correlates with these Disciplinary Core Ideas:

- **3-PS2.B.** 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.

This unit meets the Performance Expectation and Disciplinary Core Ideas, helping students gain an understanding of what causes static electric interactions between objects.

The Explore, Extend, and Evaluate sections meet the Science and Engineering Practices:

- **Asking Questions and Defining Problems:** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.
 - Ask questions that can be investigated based on patterns such as cause and effect relationships.

All sections meet the Cross-Cutting Concept:

- **Cause and Effect:** Cause and effect relationships are routinely identified, tested, and used to explain change.

The Performance Expectation 3-PS2-3 includes both static electric forces and magnetic forces. The Performance Expectation 3-PS2-4 is an engineering standard that challenges students to solve a real-world problem using magnetic forces.

We decided to create two 5E lesson plans for these two Performance Expectations. The first is 3-PS2-3, Part 1. It will include only lessons on static electricity. The second is 3-PS2-3, Part 2 and 3-PS2-4. It will include lessons on magnetic forces, as well as an engineering design challenge using magnets.

Teaching Timeline Options

Static Electricity

Below and on the following page are four different timeline options for how you might consider structuring your teaching time with the 5E Force and Motion Science Lessons. If you have the Static Electricity and Magnetism Science Stations, these are included in Option 4.

Option 1: Using Only 5E Unit Plans as Written

Day 1	Day 2	Day 3	Day 4	Day 5
Engage Activities 40 minutes	Explore Activities 55 minutes	Explain Activities 55 minutes	Extend Activities 45 to 75 minutes	Evaluate Activities 45 minutes

Option 2: Using Only 5E Unit Plans in Shorter Time Blocks

Day 1	Day 2	Day 3	Day 4	Day 5
5E Unit Engage Activities 40 minutes	5E Unit Explore Activities Parts 1 & 2 35 minutes	5E Unit Plan Explore Activity Part 3 20 minutes	5E Unit Plan Explain Activities Parts 1 & 2 35 minutes	5E Unit Plan Explain Activity Part 3 20 minutes
Day 6	Day 7	Day 8		
5E Unit Plan Extend Activities Parts 1 & 3 30 minutes	5E Unit Plan Extend Activity Part 2 All three activities - 45 minutes	5E Unit Plan Evaluate Activities 45 minutes		

Teaching Timeline Options

Static Electricity

Option 3: Using only 5E Unit Plans Abbreviated

Day 1	Day 2	Day 3	Day 4	Day 5
Engage Activities Part 3 20 minutes	Explore Activity Part 1 20 minutes	Explain Activity Part 2 20 minutes	Extend Activities Parts 1 & 2 30 minutes	Evaluate Activities Parts 1 15 minutes

Option 4: Supplementing 5E Unit Plans with the Force and Motion Science Stations as Whole Group Lessons

Day 1	Day 2	Day 3	Day 4	Day 5
5E Unit Plan Engage Activities 40 minutes	<u>Static Electricity and Magnetism Science Station:</u> <u>Explore</u> 30 minutes	5E Unit Explore Activities Parts 1 & 2 35 minutes	5E Unit Plan Explore Activity Part 3 20 minutes	5E Unit Plan Explain Activities Parts 1 & 2 35 minutes

Very important! Do not have students do the background reading that comes with the Explore science station. You are just engaging their minds, not yet teaching the concepts.

Day 6	Day 7	Day 8	Day 9	Day 10
5E Unit Plan Explain Activities Part 3 20 minutes <u>Static Electricity and Magnetism Science Station:</u> <u>Watch Video One</u> (5 minutes without questions, 15 minutes with questions)	5E Unit Plan Extend Activities Parts 1 & 3 30 minutes	5E Unit Plan Extend Activity Part 2 All three Activities - 45 minutes	Evaluate Activities 45 minutes	<u>Static Electricity and Magnetism Science Station:</u> <u>Diagram</u> 30 minutes

Materials Checklist

5E Static Electricity

Use the following checklist to make sure you have all the materials for your lessons.

Engage

- ☐ Activity Sheets
- ☐ Large foam cup
- ☐ Plastic tub or box full of water
- ☐ PVC pipe
- ☐ Picture
- ☐ Inflated balloon
- ☐ Wool or Nylon cloth (We used a wool sock)
- ☐ Plate or tray (any material except styrofoam)
- ☐ ½ Cup crispy rice cereal or pieces of tissue paper confetti

Explore

- ☐ Tray
- ☐ 1 tsp mixture of table salt and pepper
- ☐ Ruler
- ☐ Inflated balloon
- ☐ Newspaper
- ☐ Wool and/or nylon cloth or sock
- ☐ Dryer sheet
- ☐ Plastic wrap
- ☐ Sheet of aluminum foil
- ☐ Pieces of nylon, silk, wool, and/or fur
- ☐ Optional: polyester or vinyl material

Explain

- ☐ Your Try It Activity Sheet (from Explore section)
- ☐ Activity Sheets
- ☐ What Is Static Electricity? Article or Note-Taking Sheet
- ☐ Optional: Highlighters or colored markers
- ☐ Colored markers or pencils
- ☐ Balloons
- ☐ Crispy Rice cereal
- ☐ Two trays
- ☐ Assorted materials that gain electrons (plastic, vinyl, rubber, latex, Saran Wrap)
- ☐ Assorted materials that lose electrons (leather, fur, nylon, wool)
- ☐ "Putting It All Together" Activity Sheet

Extend

- ☐ Activity Sheets
- ☐ Optional: Colored pencils (for the diagrams)
- ☐ Stopwatch/Timer
- ☐ Empty, clean, and dry soda can
- ☐ 2 Balloons, inflated and tied off
- ☐ Nylon, wool, or animal fur cloth
- ☐ 2 Large foam plates
- ☐ 2 Small foam plates
- ☐ Yardstick
- ☐ 2 PVC pipes
- ☐ 2 Plastic bags (disposable grocery bags made out of thin plastic are best)

Evaluate

- ☐ Activity Sheets
- ☐ "What I Know" Rubric
- ☐ Plate with a mixture of table salt and ground black pepper
- ☐ 2 Balloons
- ☐ 2 PVC pipes
- ☐ Nylon, wool, or animal fur
- ☐ Plastic cling wrap
- ☐ Glass Bowl
- ☐ "Showing Charges" Performance Assessment and/or Worksheet Assessment