UNBALANCED FORCES

Grade 3 - Physical Science

TRAINER GUIDE

CONTENT AND PEDAGOGY
PROFESSIONAL DEVELOPMENT

Smithsonian
Science Education Center

The **Smithsonian Science Education Center** (SSEC) is an education organization within the Smithsonian Institution. The SSEC's mission is to transform K–12 *Education Through Science*™ in collaboration with communities across the globe. The SSEC promotes authentic, interactive, inquiry-based K-12 STEM teaching and learning; ensures diversity, equity, accessibility, and inclusion in K–12 STEM education; and advances STEM education for sustainable development. The SSEC achieves its goals by developing exemplary curriculum materials and digital resources; supporting the professional growth of K–12 teachers and school leaders; and conducting outreach programs through LASER (Leadership and Assistance for Science Education Reform) to help schools, school districts, state education agencies, and ministries of education throughout the world implement inquiry-based science education programs.

The **Smithsonian Institution** was created by an Act of Congress in 1846 "for the increase and diffusion of knowledge . . ." This independent federal establishment is the world's largest museum, education, and research complex and is responsible for public and scholarly activities, exhibitions, and research projects nationwide and overseas. Among the objectives of the Smithsonian is the application of its unique resources to enhance elementary and secondary education.

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Unbalanced Forces

Grade 3—Physical Science

Trainer Guide

INTRODUCTION

In 2019, the US Department of Education awarded the Smithsonian Science Education Center an early-phase Education Innovation and Research (EIR) grant to support the development, implementation, and initial evaluation of evidence-based innovations to improve student achievement. The project, called Smithsonian Science for North and South Carolina Classrooms (PR# U411C190055), took place between October 2019 and September 2024 in third-, fourth-, and fifth-grade classrooms in North and South Carolina.

Between 2020 and 2023, participating teachers in implementation schools received curriculum professional development tied to two Smithsonian Science for the Classroom curriculum modules and content and pedagogy professional development tied to the content of each module to implement in their classrooms. The Center for Research in Educational Policy (CREP) at the University of Memphis evaluated the impact of these modules and professional development on student achievement using standardized assessments, classroom observations, and teacher focus groups.

This guide was developed as a support for trainers leading content and pedagogy professional development for third grade teachers implementing the Smithsonian Science for the Classroom Physical Science module *How Can We Predict Patterns of Motion?*

HOW TO USE THIS TRAINER GUIDE

This guide shares important ideas and strategies for effectively delivering content and pedagogy professional development in connection with a Smithsonian Science for the Classroom module with educators. The professional development plan is outlined within a table on the following pages. The first column notes approximate timing for each activity and connections to standards or pedagogical strategies. The second column provides the trainer with additional directions in concise bullet points.

ROOM SETUP

To set up a classroom for this workshop:

- Move tables or desks so groups of three or four can work together.
- Locate the nearest restrooms and evacuation routes.
- Make sure speakers are working.
- Post a piece of chart paper labeled "Parking Lot" for participants to record questions and ideas for follow up later.
- Organize materials table by session and activity.
- Create an example electromagnet to display in Session 2.

WORKSHOP OVERVIEW

This trainer guide provides direction on facilitating the sessions highlighted in the table below.

Day 1		Day 2	
10:00 a.m.	Welcome Session	**10:00 a.m.**	Physical Science Content Session 2
11:00 a.m.	Misconceptions and Student Work	**12:00 p.m.**	Lunch
12:00 p.m.	Lunch	**12:45 p.m.**	Reflections
12:45 p.m.	Misconceptions and Student Work, continued	**1:30 p.m.**	Break
1:30 p.m.	Break	**1:45 p.m.**	Concurrent Sessions: Planning Ahead and Principal's Meeting
1:45 p.m.	Physical Science Content Session 1	**2:30 p.m.**	School Breakouts
3:45 p.m.	Wrap Up	**3:15 p.m.**	Closing Session
4:00 p.m.	Adjourn	**4:00 p.m.**	Adjourn

SCIENCE CONCEPTS AND STANDARDS

See Appendix 1 for the complete state standards listed here.

Sessions	Science Concepts	Standards
Day 1: Unbalanced Forces and Predicting Patterns of Motion	**1.1. Defining Force and Mass** Understanding force and mass and how they interact with one another through inertia and Newton's First Law of Motion.	**NC:** 3.P.2.1 **SC:** 3-PS2-1 **NGSS:** 3-PS2-1
	1.2. Understanding Unbalanced Forces Discerning how forces act on one another and how they can predict patterns of motion through Newton's Third Law of Motion.	**NC:** 3.P.2.1 **SC:** 3-PS2-1 **NGSS:** 3-PS2-1
Day 2: Unbalanced Forces, Magnetism, and Electricity	**2.1. Unbalanced Forces and Magnetism** Understanding magnetism and how it can cause unbalanced forces in objects.	**NC:** 3.P.3.1 **SC:** 3-PS2-3 **NGSS:** 3-PS2-3
	2.2. How Magnetism and Electricity Interact with One Another Analyzing electricity and its relationship to magnetism.	**NC:** 3.P.3.1 **SC:** 3-PS2-4 **NGSS:** 3-PS2-4

MISCONCEPTIONS AND STUDENT WORK

Throughout this professional development, the trainer leads the sessions as a facilitator (modeling the teacher role) with teachers acting as learners. Though the content is designed for adult learners, the practices used by the facilitator may be used with grades 3-5 students.

SESSION GOALS

- Identify common misconceptions in student work.
- Increase understanding of where misconceptions come from and grow.
- Categorize student misconceptions based on their origin and impact on student learning.

AGENDA AND TIMING

Sections	Minutes	Materials/Notes
Housekeeping and Introductions	20 minutes	• Chart paper
Reflections	10 minutes	• Chart paper
Conceptual Change	30 minutes	• *Good Thinking!* video
Lunch	45 minutes	
Misconception Identification	45 minutes	• Chart paper • Sticky notes • Colored dot stickers (5 colors) • Markers • "Misunderstanding Misconceptions" article

Timing	Key Points
Housekeeping and Introductions 20 minutes	**Introductions** Welcome participants to your session. Remind them that this professional learning workshop is meant to be an experience for adult learners to support their understanding of pedagogical content knowledge underlying a Smithsonian Science for the Classroom next page →

Timing	Key Points
	module. Educators may feel some discomfort as they are confronted with the limits of their own content understanding just as their students do. Reassure them that this is part of the learning process and that it may help them build empathy for the students in their classrooms. **Icebreaker Activity** Participants introduce themselves through an icebreaker activity. Ask each participant to share what they remember about the last time they were taught this subject. **Housekeeping** Preview the agenda. Verify the safety protocols in the classroom and locate the nearest restrooms, fire exit, and tornado shelter.
	Establish the Tone for the Day Divide participants into small groups and ask them to think about what they want to achieve today. What norms do they think will encourage a positive learning environment? Introduce group norm ideas: • Be brave • Be present • Ask questions • Be respectful Have each small group discuss the suggested norms and add to the whole group list of norms. Once everyone has added their ideas, ask if there are any changes, additions, or modifications that need to be made. Once the discussion is finished, this will be the social contract the group abides by for the next two days.
Reflections 10 minutes	Have participants turn to their shoulder partner and discuss their successes and challenges when teaching these units. Pairs can also discuss how they overcame challenges they faced. After partners have had time to talk, ask them to share their main points with the whole group. Record the main ideas on chart paper so everyone in the room can benefit from the shared learning.

Timing	Key Points
Conceptual Change 30 minutes	Ask participants to write down in their notebooks their ideas in response to the following questions: • How would you describe a scientific misconception? • How do you think student preconceptions can affect their understanding of new scientific concepts? Introduce the *Good Thinking!* Conceptual Change video. *Good Thinking!* is a video series created by the Smithsonian Science Education Center to support K–12 science educators through targeted short-format videos that explore common student ideas and misconceptions about a range of science topics, such as energy, chemical reactions, and natural selection, as well as pedagogical subjects such as student motivation and the myth of left- and right-brained people. Explain that the video we're about to watch is about conceptual change and explores the way students learn and develop new conceptual understanding, and shows how student misconceptions can be uncovered and addressed as part of effective learning. Show *Good Thinking!* Conceptual Change (run time: 6:26) https://s.si.edu/4dfqcQS Debrief the video by asking the participants to share how the video changed their definition of misconceptions and how preconceptions affect new learning. Have participants share anything else they found interesting or helpful. Before ending the session, let participants know that in the next session they will have a chance to explore student work and identify misconceptions. If your group is small and you're done before lunch, introduce the Keeley framework to allow more time for exploring student work after lunch.
Lunch 45 minutes	

Timing	Key Points
Keeley Framework 10 minutes	Hand out the "Misunderstanding Misconceptions" article by Page Keeley. In the article, Keeley introduces a loose framework of five types of misconceptions: conceptual misunderstanding, factual misunderstanding, naïve idea, vernacular misconceptions, and fragmentary knowledge. These different types represent a misconception based on where it comes from, how it is expressed, and what impact it has on continued learning. Understanding which type of misconception students have can assist in determining where the misconception is coming from and what the impact on learning might be.
Exploring Student Work 30 minutes	To help prepare for content sessions and future implementation, have table groups read student work and mark misconceptions with colored dot stickers, indicating which type from the framework they think the misconception falls into. Each misconception could be multiple categories in the framework.
Wrap Up 5 minutes	Ask participants to write misconceptions they found and their category from the framework on sticky notes and post them on a piece of chart paper. Let the group know they will revisit these ideas tomorrow, after they have completed the content sessions.
Trainer Note: Possible Misconceptions	Some misconceptions participants may identify include: • Force always implies motion. • All metal is magnetic. • Force and energy are the same thing. • Force can transfer from one object to another.

CONTENT SESSION 1:

Unbalanced Forces and Predicting Patterns of Motion

SESSION GOALS

- Define force and mass and how they interact with one another.
- Differentiate between balanced and unbalanced forces and their effects on objects or particles.

AGENDA AND TIMING

Sections	Minutes	Materials/Notes
1.1 Defining Force and Mass and Their Relationship to Newton's First Law of Motion	60 minutes	• Deck of cards • Copy paper
1.2 Understanding Unbalanced Forces and Their Relationship to Newton's Third Law of Motion	60 minutes	• Balloons • Straws cut into 1-inch sections • Tape • Fishing line • Pennies • Chart paper • Sticky notes (yellow and blue)

1.1 Defining Force and Mass and Their Relationship to Newton's First Law of Motion

60 minutes

Timing	Key Points
Reflecting and Journaling on "Force" 15 minutes	1. Ask participants to define "force" in their own words in their journals, before unpacking the definition: the push or pull on an object. 2. Review common misconceptions about force. Participants will also unpack how to disseminate correct information. 3. Use the scenario questions to review some common misconceptions. • Force always implies motion. *While motion may imply force, force does not always imply motion. For example, a book may be exerting force on a table just by resting on it. The table is also pushing up on the book to support it. (Demonstrate this by leaning against a wall and asking participants, Am I applying a force to this wall? Am I moving at all? Is the wall moving?)* • Force and energy are the same thing. *Force is the push or pull of an object, while energy is the ability to do work; they are not interchangeable terms. Energy is needed to exert a force.* • Force transfers from one object to another. *Energy can transfer from one object to another, but force describes an interaction between two objects.* 4. Ask participants if they have any questions or concerns before moving on.
House of Cards Activity 5 minutes	1. Have groups of two or three participants to build a house of cards that is at least two stories, using 10 to 20 playing cards. When the house of cards is built, ask each group to apply a force to the house (such as shaking the table or putting a book on top of the house). next page →

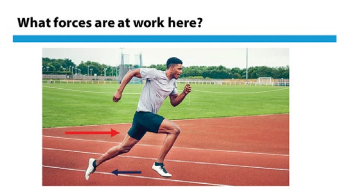
Timing	Key Points
	2. Ask the group for observations about what happened. Have them draw a force diagram for their card house. Ask: • What force did the table provide? • What force did the cards provide? • What happened when they applied a new force? 3. After they observe how the forces affect their house of cards, have the groups verbally come up with ideas on how they can help their houses withstand greater forces. Ideas might include: • Using heavier materials to better withstand a force • Adding braces to the house • Taping the cards together 4. When the small groups have finished their discussion, have them share their ideas with the larger group.
Reflecting and Journaling on "Mass" 15 minutes	1. Ask participants to define "mass" in their own words in their journal, before unpacking the definition. 2. Using the scenarios, review common misconceptions about mass: • Mass and weight are the same thing. *Mass is the amount of matter in a particle or object, while weight is the force exerted on a mass by gravity. Mass remains consistent, while weight may vary depending on the place. For example, your weight on the moon will be less than your weight on Earth, but your mass will remain the same. (We'll also take a moment to explain that mass and weight are interchangeable terms for students up to the 6th grade)* • The bigger the object, the more mass it has. *An object's mass may not be proportional to its volume. For example, a beach ball has less mass than a medicine ball.*

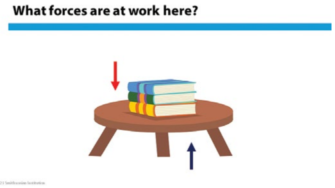
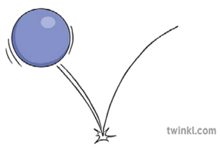
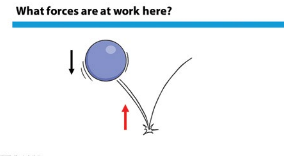
Timing	Key Points
Ball Discussion, Review of Inertia and Newton's First Law of Motion 10 minutes	1. Ask participants which ball—beach ball, medicine ball, textured medicine ball, or textured beach ball—would they like to have in a race where you push a ball down a hill. Let them discuss and journal about their answers. 2. When participants are finished, review Newton's First Law of Motion and the definition of inertia. • Newton's First Law of Motion says a body at rest will remain at rest unless acted upon by an unbalanced force. It also states that a body in motion will maintain that motion, in the same direction and with the same speed, unless acted upon by an unbalanced force. • Inertia: An object or particle will continue in its existing state of rest or uniform motion in a straight line unless that state is changed by an external force. The greater the mass, the greater the inertia. 3. Once you have unpacked the definitions, ask participants if this changes their answers. How would the weight and texture of the ball affect the race? 4. Ask participants to theorize about what other forces would be acting on the balls they selected. Ask questions about the different possibilities that could arise: • What if the hill was grassy? • What if the hill was made of concrete? • What if there wasn't a hill?
Paper Plane Activity, Reviewing External Forces 15 minutes	1. Give every participant a piece of paper and ask them to make an airplane. 2. Once they have made the planes, they can throw or launch them and observe their trajectory and eventual landing. Have them record their observations in their notebooks as they test their planes. next page →

Timing	Key Points
	3. Have groups share what forces they think are acting on the plane as it moves. Forces include: • Thrust: the force pushing the plane forward • Drag: the friction of the air against the plane • Gravity: the force of Earth pulling down on the plane • Lift: the force of the air pushing up on the wings 4. Ask participants to journal and reflect on their learning so far, and ask any clarifying questions.

1.2 Understanding Unbalanced Forces and Their Relationship to Newton's Third Law of Motion

60 minutes

Timing	Key Points
Review Force, Acceleration, and Inertia 5 minutes	Show the YouTube video *Newton's Third Law of Motion Demonstrated in Space* (https://www.youtube.com/watch?v=ZkVU-bj9bDk) as a review of what we've covered in the first half of the day and an introduction to Newton's Third Law of Motion.
Discern Opposing Forces 10 minutes	1. Have participants review examples of different forces acting on one another and indicate which two opposing forces are involved. • A person running on a track: *feet push back, track pushes forward*   *Figure 1. Runner (credit: Getty Images)* *Figure 2. What forces are at work here? (credit: Addy Allred, Smithsonian Science Education Center)* next page →

Timing	Key Points
	• A book sitting on a table: *book pushes down, table pushes up*   *Figure 3. Books (credit: Getty Images)* *Figure 4. What forces are at work here? (credit: Addy Allred, Smithsonian Science Education Center)* • A ball bouncing on the floor: *ball pushes down, floor pushes up*   *Figure 5. Ball (credit: twinkl.com)* *Figure 6. What forces are at work here? (credit: Addy Allred, Smithsonian Science Education Center)* 2. For each scenario, show the first image to introduce the scenario and then have participants draw a force diagram. A simple force diagram for each scenario is on the second slide. 3. Participants may identify forces that are not shown in the image, such as friction. If the participants bring up other forces, discuss what would need to happen for the forces in the image to balance and become equal and opposite. For example, the force the runner is exerting would need to compensate for friction and gravity.
Review Newton's Third Law of Motion and Unbalanced Forces 10 minutes	1. Have participants reflect on the past few examples and think about examples from their own classrooms or experiences and use them to create similar diagrams in their notebook to illustrate opposing forces. Possible examples include: • Newton's cradle demonstration • Washer swing from the module • Pushing a box next page →

<table>
<tr><th>Timing</th><th>Key Points</th></tr>
<tr><td></td><td>2. An example of a child pulling a sled will illustrate the challenge of Newton's Third Law and how unbalanced forces can create motion:
• A child is pulling a sled. According to Newton's Third Law of Motion (Every action has an equal opposite reaction. In every interaction between two objects there is a pair of opposite forces acting on each object at the same time.), the sled is pulling back with an equal amount of force as the child. But if the child starts walking, the sled moves.

3. Ask participants to discuss in small groups how this is possible and what unbalanced forces are at work.</td></tr>
<tr><td>Balloon Activity
20 minutes</td><td>1. Divide participants into groups of four to five and give each group a balloon, a 1-inch straw, some tape, and a length of fishing line that reaches across the classroom.

2. Have them make a balloon "thruster":
• Tie one end of the fishing line to a desk or post, or tape it to the wall.
• Thread the straw onto the fishing line.
• Blow up the balloon and pinch the end but don't tie it off.
• Hold the fishing line taut and tape the straw to the side of the balloon, with the pinched opening facing away from the center of the room.

3. The goal is to release the balloon and have it reach the middle of the room.

4. Have groups test and theorize how they can reach this goal, either by decreasing net external force or by taping pennies to the balloon to add extra mass to their balloon thruster.

next page →</td></tr>
</table>

Timing	Key Points
	5. Ask questions to help them conceptualize these ideas and apply their knowledge of Newton's First and Third Laws of Motion: • What external forces are affecting the balloon? • How will adding mass to the balloon affect its trajectory? • Why does the balloon eventually stop?
Reflection 10 minutes	1. Have participants journal and reflect on their learning so far and ask any clarifying questions. 2. If there is a question you do not know the answer to, add it to the parking lot until you can find the answer. Learner Reflection Wrap up the session by having a general conversation to debrief the session as learners. Ask questions such as: • Any questions about the content covered in the session? • What new learning did you encounter today? • What misconceptions did you debunk today? Teacher Reflection Wrap up the session by having a general conversation to debrief the session as teachers. Ask questions such as: • Where can you tie these concepts back to the curriculum module? Address content and practices. • Any misconceptions that teachers may expect from their students on the science concepts covered in the session? Exit Ticket Ask participants to record their "sunshines and blues" for the day on yellow (sunshines) and blue (blues) sticky notes and add them to a piece of chart paper before leaving for the day.

CONTENT SESSION 2:

Unbalanced Forces, Magnetism, and Electricity

SESSION GOALS

- Identify magnetism and electricity as unbalanced forces that require no contact between objects.
- Determine the relationship between magnetism and electricity.

AGENDA AND TIMING

Sections	Minutes	Materials/Notes
2.1 Unbalanced Forces and Magnetism	50 minutes	• Paper • Bar magnet • Iron filings • U-shaped magnet • Cow magnet • Dowel Rod • Fishing Line • Metal Washer • Tape
2.2 How Magnetism and Electricity Interact with One Another	70 minutes	• Styrofoam plates • Wool cloth • Copper wire • Iron nails • D-batteries • Masking tape • Paper clips

2.1 Unbalanced Forces and Magnetism

50 minutes

Timing	Key Points
Introduction 5 minutes	Introduce the topic and science concepts that will be covered in this section.
Review Previous Content 10 minutes	1. Have participants review information from the previous day, including Newton's First and Third Laws of Motion. 2. Ask them to cite examples from their personal or classroom experiences that demonstrate unbalanced forces. 3. After reviewing the content, set up a pendulum with a dowel rod and metal washer hung using fishing line to demonstrate predicting patterns of motion. 4. Have participants journal about other forces that could affect the pendulum, including forces that do not require contact (such as magnetism).
Defining and Analyzing Magnetism 15 minutes	1. Review the definition of magnetic force: attraction or repulsion that arises between electrically charged particles because of their motion. 2. Review some key facts about magnets and magnetic force: • Magnets do not attract all metals. Magnets only attract metals with magnetic properties, including iron, cobalt, and nickel. • Magnets always have a north and south pole. Magnets always attract opposite poles and repel like poles.
Magnetic Field Activity 20 minutes	1. Divide into groups of two or three people. Give each group two pieces of paper, a bar magnet, and some iron filings. next page →

Timing	Key Points
	2. Have them place a piece of paper on top of the bar magnet and sprinkle iron filings on the paper, observing how the filings are arranged. 3. Ask them to diagram in their notebooks what the magnetic field looks like. 4. Repeat the activity using the U-shaped magnets and cow magnets. Groups should be able to hypothesize on the shape of the magnetic field before the demonstration, and diagram it in their notebooks. 5. Tell participants that in the next session they will handle handmade electromagnets using batteries, masking tape, copper wire, and an iron nail. Later on they will unpack how the electromagnet works.

2.2 How Magnetism and Electricity Interact with One Another

70 minutes

Timing	Key Points
Unpacking Electromagnets and Electricity 15 minutes	1. Review the definition and application of electromagnets, including practical applications such as electrical equipment and appliances. 2. Review electrical currents and static electricity, including the definition of electrons and their properties. 3. Have small groups brainstorm examples of electrical currents, static electricity, and electromagnets in their day-to-day life.
Styrofoam Plate Activity 15 minutes	1. Divide into groups of two or three people. Give each group two Styrofoam plates and a wool cloth. next page →

Timing	Key Points
	2. To demonstrate negative charges repelling each other, have participants rub the bottom of both plates with the cloth to generate a negative charge, then attempt to place the plates on each other with their bottoms touching. The higher plate should float and repel the lower plate. 3. Ask groups to reflect on the demonstration and analyze why the two plates repel each other. 4. Ask them to diagram in their notebooks where the negative charges are in this demonstration and in the balloon and aluminum can demonstration they observed in Lesson 7 of the module *How Can We Predict Patterns of Motion?* 5. After participants have diagramed both scenarios, have them present and discuss.
Electromagnet Race 20 minutes	1. Divide into teams of two. Challenge each team to build an electromagnet and use it to move 100 paper clips from one side of the classroom to the other. 2. They'll build the magnet by wrapping copper wire around the iron nail (the more tightly that it's coiled, the stronger the magnet will be, but let the teams figure out that detail on their own) and placing the ends of the wire on opposite sides of the D-battery, securing them with two or three layers of masking tape. 3. Once they build their electromagnets, they will theorize about how to make their magnet stronger or move the paper clips more efficiently. 4. The only rules for the race are: • No running. • No picking up the paper clips with anything but the electromagnet.

Timing	Key Points
Reflection 15 minutes	1. Have participants journal and reflect on their learning and ask any clarifying questions. 2. If there is a question you do not know the answer to, add it to the parking lot until you can find the answer. Learner Reflection Wrap up the session by having a general conversation to debrief the session as learners. Ask questions such as: • Any questions about the content covered in the session? • What new learning did you encounter today? • What misconceptions did you debunk today? Teacher Reflection Wrap up the session by having a general conversation to debrief the session as teachers. Ask questions such as: • How confident are you feeling about the science concepts underlying the module *How Can We Predict Patterns of Motion*? • Where can you tie these concepts back to the curriculum module? Address content and practices. • Any misconceptions that teachers may expect from their students on the science concepts covered in the session? • Any other general questions?

REFLECTIONS

Before this session, consolidate the misconceptions from the first day into a number appropriate for your group.

SESSION GOALS

- Identify common misconceptions in student work.
- Increase understanding of where misconceptions come from and grow.
- Categorize student misconceptions based on their origin and impact on student learning.

Timing	Key Points
Addressing Misconceptions 30 minutes	1. Refer back to the misconceptions that were collected in the first session. 2. Break into small groups and have each group select a misconception to work on. 3. Give the groups time to discuss the misconceptions, what factors are part of the misconception, and how they might address it in the classroom, based on their experiences during the content sessions or other resources they may have access to. Ideally, groups are leveraging activities from their Smithsonian Science for the Classroom modules. 4. Have groups share out.
Grade Level Planning 15 minutes	Discuss what the next school year looks like, including when teachers might implement the lessons, what testing is upcoming, if there are any interesting resources available, etc.
Exit Ticket	Ask participants to record their "sunshines and blues" for the day on yellow (sunshines) and blue (blues) sticky notes and add them to a piece of chart paper before leaving for the day.

APPENDIX 1: SCIENCE STANDARDS

NORTH CAROLINA SCIENCE ESSENTIAL STANDARDS

3.P.2.1 Recognize that air is a substance that surrounds us, takes up space and has mass.

3.P.3.1 Recognize that energy can be transferred from one object to another by rubbing them against each other.

SOUTH CAROLINA COLLEGE- AND CAREER-READY SCIENCE STANDARDS 2021

3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

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

3-PS2-4 Develop possible solutions to a simple design problem by applying scientific ideas about magnets.

NEXT GENERATION SCIENCE STANDARDS (NGSS)

3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

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.

3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets.

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