

# 3rd Grade Unit 2: Electrical and Magnetic Forces

Content Area: **Science**  
Course(s): **Science Grade 3**  
Time Period: **MP1**  
Length: **10 days**  
Status: **Published**

## NJSLS - Science

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SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
SCI.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.
SCI.3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.

## Science and Engineering Practices

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### Asking Questions and Defining Problems

Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3)

Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4)

Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)

### Constructing Explanations and Designing Solutions

Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)

## Disciplinary Core Ideas

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### PS2.B: Types of Interactions

Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depends on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3, 3-PS2-4)

### **ETS1.A: Defining and Delimiting Engineering Problems**

Possible solutions to a problem are limited by the available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)

### **ETS1.B: Developing Possible Solutions**

Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)

At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)

## **Crosscutting Concepts**

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### **Cause and Effect**

Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)

### **Influence of Science, Engineering, and Technology on Society and the Natural World**

People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)

Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

### **Interdependence of Science, Engineering, and Technology**

Scientific discoveries about the natural world can often lead to new and improved technologies, which are

developed through the engineering design process. (3-PS2-4)

## **Rationale and Transfer Goals**

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### **How can we use our understanding about magnets to solve problems?**

In this unit of study, students determine the effects of balanced and unbalanced forces on the motion of an object and the cause-and-effect relationships of electrical or magnetic interactions to define a simple design problem that can be solved with magnets. The crosscutting concept of cause and effect, and the interdependence of science, engineering, and technology, and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

Students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

## **Enduring Understandings**

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There are similarities among both magnetic objects and nonmagnetic objects.

There are balanced and unbalanced forces.

## **Essential Questions**

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What are the relationships between electrical and magnetic forces?

How can we use our understanding about magnets to solve problems?

## **Content - What will students know?**

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- Cause-and-effect relationships are routinely identified, tested, and used to explain change.
- 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.
- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.
- People's needs and wants change over time, as do their demands for new and improved technologies.
- Possible solutions to a problem are limited by available materials and resources (constraints).
- The success of a designed solution is determined by considering the desired features of a solution (criteria).

## **Skills - What will students be able to do?**

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- Identify cause-and-effect relationships that are routinely identified, tested, and used to explain change.
- Ask questions that can be investigated based on patterns such as cause-and effect relationships.
- Ask questions to determine cause-and-effect relationships in electric or magnetic interactions between two objects not in contact with each other.
- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Define a simple design problem that can be solved by applying scientific ideas about magnets (e.g., constructing a latch to keep a door shut or creating a device to keep two moving objects from touching each other).
- Define a simple design problem that can be solved through the development of an object, tool, process, or system, and include several criteria for success and constraints on material, time, or cost.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- Describe electric and magnetic forces between a pair of objects when they are/are not in contact.
- Create situations to understand the sizes of the forces depending on the properties of the objects and their distances apart.
- Identify the needs for new technologies and solutions based on changing needs of people.

## **Activities - How will we teach the content and skills?**

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- Mystery Science Invisible Forces Lesson 4
- Mystery Science Invisible Forces Lesson 5
- Whole group instruction and discussion.
- Read Alouds
- Group and Individual Projects
- Hands-on discovery when possible; creating models
- Webquests/Internet “field trips”

## **Formative Assessments**

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- Mystery Science Invisible Forces Lesson 4 Assessment
- Mystery Science Invisible Forces Lesson 5 Assessment
- Mystery Science Invisible Forces Performance Task
- Teacher Observation
- Student projects/models
- Exit Tickets

## **Summative Assessments**

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- Mystery Science Invisible Forces Performance Task
- [Mystery Science Invisible Forces Unit Assessment](#)
- Tests/Quizzes
- [Grade 3 Science Benchmark #1](#) (taken after Unit 2)

## Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
<ul style="list-style-type: none"><li>• Electric and magnetic forces between a pair of objects do not require that the objects be in contact.</li><li>• 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.</li></ul>	<p>Kindergarten: Pushes and pulls can have different strengths and directions.</p> <p>Kindergarten: Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.</p> <p>Kindergarten: When objects touch or collide, they push on one another and can change motion.</p> <p>Kindergarten: A bigger push or pull makes things speed up or slow down more quickly.</p> <p>Kindergarten: A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.</p> <p>Grade 1: Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.</p>	<p><a href="#">K-PS2-1 Activities</a></p> <p><a href="#">K-PS2-2 Activities</a></p> <p><a href="#">1-ESS1-1 Activities</a></p>

## Key Resources

[Mystery Science](#)

[Investigate the Magnetic Force Field](#)

## Career Readiness, Life Literacies, & Key Skills

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PFL.9.1.5.CR.1	Compare various ways to give back and relate them to your strengths, interests, and other personal factors.
WRK.9.2.5.CAP.1	Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
WRK.9.2.5.CAP.3	Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
WRK.9.2.5.CAP.4	Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
TECH.9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).
TECH.9.4.5.CI.2	Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
TECH.9.4.5.DC.4	Model safe, legal, and ethical behavior when using online or offline technology (e.g., 8.1.5.NI.2).
TECH.9.4.5.DC.8	Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).
TECH.9.4.5.TL.2	Sort and filter data in a spreadsheet to analyze findings.
TECH.9.4.5.TL.3	Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols.
TECH.9.4.5.IML.2	Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).
TECH.9.4.5.IML.3	Represent the same data in multiple visual formats in order to tell a story about the data.

## Interdisciplinary Connections

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### NJSLS ELA

RI.CR.3.1. Ask and answer questions and make relevant connections to demonstrate understanding of an informational text, referring explicitly to textual evidence as the basis for the answers. (3-PS2-3)

RI.IT.3.3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-PS2- 3)

RI.AA.3.7. Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence) to support specific points the author makes in a text.

(3-PS2-3)

RI.CR.5.1. Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text. (3-5-ETS1-2)

RI.MF.3.6. Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-5-ETS1-2)

RI.CT.5.8. Compare and contrast the authors' approaches across two or more informational texts within the same genre or about texts on the same or similar topics. (3-5-ETS1-2)

SL.ES.3.3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)

W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use several sources to support the proposed central idea.(3-5-ETS1-1)

W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources. (3-5-ETS1-1)

## **NJSLS Mathematics**

MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1, 3-5-ETS1-2)

MP.4 Model with mathematics. (3-5-ETS1-1, 3-5-ETS1-2)

MP.5 Use appropriate tools strategically. (3-5-ETS1-1, 3-5-ETS1-2)

3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1, 3-5-ETS1-2)

