

Old Unit 3: Electrical and Magnetic Forces (Science Template)

Content Area: **Science**
Course(s): **Science 3**
Time Period: **December**
Length: **3 weeks**
Status: **Published**

Unit Summary

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 understanding of the core ideas.

Standards

LA.RI.3.1	Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
LA.RI.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.
LA.RI.3.8	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.
LA.SL.3.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.3.3	Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
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.
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.

Student Learning Objectives

SLO 1 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces

between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.] (3-PS2-3)

SLO 2 Define a simple design problem that can be solved by applying scientific ideas about magnets.* [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.] (3-PS2-4)

SLO 3 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)

Driving Questions

How can we use our understandings about magnets be used to solve problems?

What are the relationships between electrical and magnetic forces?

How can we use our understandings about magnets be used to solve problems?

DCI's Disciplinary core ideas

Part A:

- 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

Part B:

- 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.
- 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.
- For forces between two magnets, the size of the force depends on their orientation relative to each other.
- 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).

- 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.

Science and Engineering Practices

Analyzing and Interpreting Data

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)

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)