

# Educational Resources from *Phenomenon Science Education*

## Student Proficiency Goals for **NGSS 3-PS2-3**



### Information about 3-PS2-3

#### **NGSS 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.

#### **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 Limits.**

Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.

#### **Science and Engineering Practice (Asking Questions and Defining Problems)**

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

#### **Disciplinary Core Idea (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 depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

#### **Crosscutting Concept (Cause and Effect)**

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

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## Student Proficiency Goals for **NGSS 3-PS2-3**



### Student Proficiency Goals

#### SEP (Asking Questions and Defining Problems):

- Students ask questions based on their observations of interactions between two objects that are not in contact with each other.
- With guidance, students ask questions whose answers can describe the cause-and-effect relationship pertaining to the distance between the objects.
- With guidance, students ask questions whose answers can describe the cause-and-effect relationship pertaining to the size of the force between the objects.
- With guidance, students ask questions whose answers can describe the cause-and-effect relationship pertaining to the direction of the force between the objects (attraction or repulsion).
- With guidance, students ask questions whose answers can describe the cause-and-effect relationship pertaining to the type of the force between the objects (electric or magnetic).
- With guidance, students determine which of their questions can be investigated to obtain answers.

#### DCI (PS2.B Types of Interactions):

- Students know that electric and magnetic interactions between pairs of objects do not require that the objects be in contact.
- Students know that the size of electric and magnetic forces between pairs of objects depends in part on the distance between the objects.
- Students know that the size and direction of electric and magnetic forces between pairs of objects depends in part on the orientation of the objects.
- Students know that the characteristics of electric and magnetic forces between pairs of objects depends in part on the properties of the objects.

#### CCC (Cause and Effect):

- Students consider the cause-and-effect relationship between the characteristics of electric and magnetic forces and the properties of the interacting objects.
- Students consider how to design investigations to define cause-and-effect relationships between the characteristics of electric and magnetic forces and the properties of the interacting objects.