

Educational Resources from *Phenomenon Science Education*  
Student Proficiency Goals for **NGSS MS-PS2-3**



**Information about MS-PS2-3**

**NGSS Performance Expectation MS-PS2-3.**

Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

**Clarification Statement.**

*Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.*

**Assessment Limits.**

*Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.*

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

- Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.

**Disciplinary Core Idea (PS2.B: Types of Interactions)**

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.

**Crosscutting Concept (Cause and Effect)**

- Cause and effect relationships may be used to predict phenomena in natural or designed systems.

## Educational Resources from *Phenomenon Science Education*

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



#### Student Proficiency Goals

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

- Students observe phenomena involving electromagnetic interactions and identify electromagnetic (electric and magnetic) forces.
- Students ask questions that can be investigated using available resources about electromagnetic (electric and magnetic) forces.
- Students examine collected or given data that show the relative strength of electromagnetic forces, and the strength of the involved charges, currents, or magnets.
- Students examine collected or given data that show the relative strength of electromagnetic forces, and the distances between the interacting objects.
- Students ask questions about the data to determine the effects of the strength of the involved charges, currents, or magnets on electromagnetic forces.
- Students ask questions about the data to determine the effect of the distance between the interacting objects on electromagnetic forces.
- Students propose hypotheses based on their observations and scientific principles about factors that affect the strength of electromagnetic forces.

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

- Students know that electric and magnetic forces are both electromagnetic forces.
- Students know that electromagnetic forces can be attractive or repulsive.
- Students know that the magnitude of an electromagnetic force depends on the magnitude of the charges, currents, or magnetic strengths involved in the interaction.
- Students know that the magnitude of an electromagnetic force depends on the distance between the interacting objects.

##### CCC (Cause and Effect):

- Students consider how data show the effect, on the electromagnetic force, of changing the magnitude of the charges, currents, or magnetic strengths in interactions.
- Students consider how data show the effect, on the electromagnetic force, of changing the distance between interacting objects.
- Students predict effects, on phenomena involving electromagnetic interactions, of changing the magnitude of the charges, currents, or magnetic strengths in interactions.
- Students predict the effect, on phenomena involving electromagnetic interactions, of changing the distance between interacting objects.