

Educational Resources from *Phenomenon Science Education*

Student Proficiency Goals for **NGSS MS-PS2-5**



Information about MS-PS2-5

NGSS Performance Expectation MS-PS2-5.

Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Clarification Statement.

Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.

Assessment Limits.

Assessment is limited to electric and magnetic fields and limited to qualitative evidence for the existence of fields.

Science and Engineering Practice (Planning and Carrying Out Investigations)

- Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation.

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

- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).

Crosscutting Concept (Cause and Effect)

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

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Student Proficiency Goals

SEP (Planning and Carrying Out Investigations):

- Students identify and describe the specific purpose and goals of investigations that can provide evidence of fields existing between objects that exert forces on each other even though the objects are not in contact.
- Students identify and describe the data that will serve as evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- Students describe the tools and methods that will be used in investigations to collect the data that will serve as evidence.
- Students evaluate their experimental designs to determine if they will produce the data required to provide evidence of fields existing between objects that exert forces on each other even though the objects are not in contact.
- Students conduct an investigation to collect identified data about objects exerting forces on each other even though the objects are not in contact.

DCI (PS2.B Types of Interactions):

- Students know that electromagnetic (electric and magnetic) and gravitational forces act at a distance.
- Students know that forces that act at a distance can be explained by fields.
- Students know that fields can be mapped by observing the effects of the field on test objects, such as a charged object in an electric or magnetic field, or a ball in a gravitational field.
- Students know that electric fields and magnetic fields are related; electric fields are the result of charges that do not move, and magnetic fields are the result of moving charges.

CCC (Cause and Effect):

- Students consider how data can show the effects of unseen forces on objects.
- Students consider how data can show the presence of fields between objects that exert forces on each other without contacting each other.
- Students consider how the results of an investigation on evidence of fields existing between objects that are not in contact allows them to predict the effects of similar fields acting on other objects that are not in contact.