<table>
<tr><td>Strand 7.1: Forces interact with matter</td><td colspan="2">Forces are push or pull interactions between two objects. Changes in motion, balance and stability, and transfers of energy are all facilitated by forces on matter. Forces, including electric, magnetic, and gravitational forces, can act on objects that are not in contact with each other. Scientists use data from many sources to examine the cause and effect relationships determined by different forces.</td></tr>
<tr><td>Standard: 7.1.3

(MS-PS2-5)</td><td colspan="2">Construct a model using observational evidence that describes the nature of fields exist between objects that exert forces on each other even though the objects are not in contact. Emphasize the <u>cause and effect</u> relationship between properties of objects (such as magnets or electrically-charged objects) and the forces they exert.</td></tr>
<tr><td>SEP/CCC</td><td>Developing and using models
Develop and use a model to describe phenomena.</td><td><u>Cause and Effect: mechanism and explanation</u>
Cause and effect relationships may be used to predict phenomena in natural or designed systems.</td></tr>
<tr><td>DCI</td><td colspan="2">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).</td></tr>
<tr><td>Student Friendly Objectives</td><td colspan="2">I can create a model that shows forces exist between objects even when they are not touching.</td></tr>
<tr><td>Big Idea</td><td colspan="2">There are forces between objects that can affect them, even if they are not touching.</td></tr>
<tr><td rowspan="2">Vertical Learning Progression Alignment</td><td>Previous Science Content
(Discussed in K-5 Standards)</td><td>Future Science Content
(Discussed in 9-12 Standards)</td></tr>
<tr><td>● Some forces act through contact, some forces act even when the objects are not in contact.</td><td>● Forces at a distance are explained by fields that can transfer energy and can be described in terms of the arrangement and properties of the interacting objects and the distance between them. These forces can be used to describe the relationship between electrical and magnetic fields.
● Measurement of fields
● Field diagrams
● Circuits, batteries</td></tr>
<tr><td>6-8 Band</td><td colspan="2">● Forces that act at a distance involve fields that can be mapped by their relative strength and effect on an object.</td></tr>
<tr><td>What students will be doing this year:</td><td colspan="2">1. Components of the model
a. To make sense of a given phenomenon students develop a model which includes providing evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
i. Forces include:
1. The attraction and repulsion of magnets
2. Static electricity (electric fields)
2. Relationships
a. In the model, students identify and describe relationships between components, including:
i. Evidence that two interacting objects can exert forces on each other even though the two interacting objects are not in contact with each other.
ii. Evidence that the cause of a force on one object is the interaction with the second object (e.g., evidence for the presence of force disappears when the second object is removed from the vicinity of the first).

3. Connections
a. Students use the model to explain how motion, balance and stability of objects can be affected by unseen forces.</td></tr>
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