## Teacher's Edition
Grade 3 • Unit 1

# Inspire Science
## Forces Around Us

Mc Graw Hill Education

## Performance Expectations at a Glance

In this unit, students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to perform the following Performance Expectations.

| **Performance Expectations** | MODULE: **Forces and Motion** | MODULE: **Electricity and Magnetism** |
|---|---|---|
| 3–5-ETS1-1 | ● | ● |
| 3–5-ETS1-2 | ● | ● |
| 3-PS2-1 | ● | |
| 3-PS2-2 | ● | |
| 3-PS2-3 | | ● |
| 3-PS2-4 | | ● |

## Correlations by Module to the NGSS

| MODULE: Forces and Motion | | |
|---|---|---|
| **3–5-ETS** | **Engineering Design** | |
| **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.** | *8–9*, 24–25, 33, *36–37, 41–44* |
| **SEP** Science and Engineering Practices | | |
| **Asking Questions and Defining Problems**<br>Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.<br>• 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) | | *8–9*, 11, *24–25*, 33, *36–37*, *43–44* |
| **DCI** Disciplinary Core Ideas | | |
| **ETS1.A: Defining and Delimiting Engineering Problems**<br>• 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. (3–5-ETS1-1) | | *8–9*, *24–25*, 33, *36–37*, *43–44* |

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| CCC Crosscutting Concepts | |
|---|---|
| **Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• People's needs and wants change over time, as do their demands for new and improved technologies. (3–5-ETS1-1) | *36–37*, *43–44* |

| 3–5-ETS | Engineering Design | |
|---|---|---|
| 3–5-ETS1-2 | **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** | *24–25*, *24–25*, *33*, *36–37*, *41–44* |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3–5-ETS1-2) | | *24–25*, *30–31, 36–37*, *43–44* |
| **DCI Disciplinary Core Ideas** | | |
| **ETS1.B: Developing Possible Solutions**<br>• Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3–5-ETS1-2)<br>• At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3–5-ETS1-2) | | 24–25, *36–37*, *43–44* |
| **CCC Crosscutting Concepts** | | |
| **Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3–5-ETS1-2) | | *36–37*, 43–44 |

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# Next Generation Science Standards

| 3-PS2 | Motion and Stability: Forces and Interactions | |
|---|---|---|
| 3-PS2-1 | **Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.**<br>*[Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]* | *24–26*, 27, 29, 30–31, *36–37*, *43–44* |
| **SEP Science and Engineering Practices** | | |
| **Connections to Nature of Science**<br>Scientific Investigations Use a Variety of Methods<br>Science investigations use a variety of methods, tools, and techniques. (3-PS2-1) | | *24–25*, 30–31, *36–37* |
| **Planning and Carrying Out Investigations**<br>Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.<br>• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1) | | *8–9*, *16–17*, 24–25, 41–44 |
| **DCI Disciplinary Core Ideas** | | |
| **PS2.A: Forces and Motion**<br>• Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1) | | *26*, 28–29, 30–31 |
| **PS2.B: Types of Interactions**<br>• Objects in contact exert forces on each other. (3-PS2-1) | | 28–29, 30–31, *36–37* |
| **CCC Crosscutting Concepts** | | |
| **Cause and Effect**<br>• Cause and effect relationships are routinely identified. (3-PS2-1) | | *25*, 28–29, 30–31, *36–37* |

*Inquiry activities are in Italics.*

| 3-PS2 | Motion and Stability: Forces and Interactions | |
|---|---|---|
| **3-PS2-2** | **Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.**<br>*[Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a seesaw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]* | *8–9*, 13–14, *16–17*, *24–26* |
| **SEP Science and Engineering Practices** | | |
| **Connections to Nature of Science**<br>Science Knowledge is Based on Empirical Evidence<br>• Science findings are based on recognizing patterns. (3-PS2-2) | | *8*, 13, *16–17* |
| **Planning and Carrying Out Investigations**<br>Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.<br>• Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2) | | *8–9*, 16–17 |
| **DCI Disciplinary Core Ideas** | | |
| **PS2.A: Forces and Motion**<br>• The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2) | | *8–9*, 12–13, 14, *16–17* |
| **CCC Crosscutting Concepts** | | |
| **Patterns**<br>• Patterns of change can be used to make predictions. (3-PS2-2) | | *8–9*, 13, 14 |

| Other Correlations | |
|---|---|
| **Math Connections** | |
| 3.O.A.A.1-7 | *16–17* |
| MP.5 | *8*, *16–17*, *25*, *37* |
| MP.6 | *8*, 11, *16–17*, *25*, *37* |

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|---|---|
| **ELD Connections** | |
| ELD.P1.3.1 | Teacher Edition *Only*: 18 |
| ELD.P1.3.5 | Teacher Edition *Only*: 35 |
| ELD.P1.3.12 | Teacher Edition *Only*: 12–13, 38 |
| **CCSS ELA/Literacy Connections** | |
| RI.3.4 | 10–12, 32 |
| L.3.4 | 10–12 |
| **ALSO INTEGRATES** | |
| CCC Stability and Change | 12–14 |
| Math 3.MD.B.4 | *24–25* |
| ELA RI.3.1 | 28–29, 30–31, *37* |
| ELA RI.3.2 | 32–33 |
| ELA W.3.7 | 32–33 |
| ELA W.3.8 | 32–33 |

## MODULE: Electricity and Magnetism

| 3–5-ETS | Engineering Design | |
|---|---|---|
| **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.** | *52–53*, 60, 62, *63*, *88–89* |
| **SEP Science and Engineering Practices** | | |
| **Asking Questions and Defining Problems**<br>Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.<br>• 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) | | *52–53*, 60, 62, *63*, *88–89* |

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| DCI Disciplinary Core Ideas | |
|---|---|
| **ETS1.A: Defining and Delimiting Engineering Problems**<br>• 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. (3–5-ETS1-1) | 60,*63*, *88–89* |
| **CCC Crosscutting Concepts** | |
| **Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• People's needs and wants change over time, as do their demands for new and improved technologies. (3–5-ETS1-1) | 60, 62, *63*, *88* |

| 3–5-ETS | Engineering Design | |
|---|---|---|
| **3–5-ETS1-2** | **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** | *78–79*, *88–89* |
| **SEP Science and Engineering Practices** | | |
| **Constructing Explanations and Designing Solutions**<br>Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.<br>• Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3–5-ETS1-2) | | *70–71*, *78–79*, *88–89* |
| **DCI Disciplinary Core Ideas** | | |
| **ETS1.B: Developing Possible Solutions**<br>• Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3–5-ETS1-2)<br>• At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3–5-ETS1-2) | | *70–71*, *78–79*, *88–89* |
| **CCC Crosscutting Concepts** | | |
| **Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3–5-ETS1-2) | | 76, *78–79*, 80, *88–89* |

*Inquiry activities are in Italics.*

| 3-PS2 | Motion and Stability: Forces and Interactions | |
|---|---|---|
| **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.**<br>*[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.]*<br>*[Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]* | *52–53*, 56–57, 60, 62, *63* |
| **SEP** Science and Engineering Practices | | |
| **Asking Questions and Defining Problems**<br>Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.<br>• Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) | | *52–53*, 56–57, 60, 62, *63* |
| **DCI** Disciplinary Core Ideas | | |
| **PS2.B: Types of Interactions**<br>• 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. (3-PS2-3) | | *52–53*, 56–57, *63* |
| **CCC** Crosscutting Concepts | | |
| **Cause and Effect**<br>• Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3) | | *52–53*, *63*, *70–71*, *78–79*, 81 |

| 3-PS2 | Motion and Stability: Forces and Interactions | |
|---|---|---|
| **3-PS2-4** | **Define a simple design problem that can be solved by applying scientific ideas about magnets.**<br>*[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.]* | *70–71*, *74*, 75, *78–79*, 81 |

*Inquiry activities are in Italics.*

| SEP Science and Engineering Practices | |
|---|---|
| **Asking Questions and Defining Problems**<br>• Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4) | *71*, 73, *74*, 75, *78–79*, 81 |
| **DCI Disciplinary Core Ideas** | |
| **PS2.B: Types of Interactions**<br>• 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. (3-PS2-4) | *70–71*, 72 –73, *74*, 75, *78–79*, 81 |
| **CCC Crosscutting Concepts** | |
| **Interdependence of Science, Engineering, and Technology**<br>• Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4) | 76, *78–79*, 81 |

| Other Correlations | |
|---|---|
| **CCSS Math Connections** | |
| MD.B.3 | *78–79* |
| **ELD Connections** | |
| ELD P1.3.1 | 81 |
| ELD. P1.3.5 | Teacher Edition *Only*: 62, 80 |
| **CCSS ELA/Literacy Connections** | |
| ELD P1.3.12 | 55, 64, 77 |
| L.3.4 | 56–57, 72–73 |
| L.3.5 | 72–73 |
| RI.3.4 | 56–57, 58 –59, 72–73, 76 |
| RI.3.7 | 56, 73, 81 |

*Inquiry activities are in Italics.*