

Grade Three



Standards Arranged by Disciplinary Core Ideas

California Department of Education

Clarification statements were created by the writers of NGSS to supply examples or additional clarification to the performance expectations and assessment boundary statements.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

The section titled “Disciplinary Core Ideas” is reproduced verbatim from *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Revised March 2015.

3-LS1 From Molecules to Organisms: Structures and Processes

3-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. *[Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]*

The performance expectation(s) above were developed using the following elements from the National Research Council (NRC) document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> Develop models to describe phenomena. (3-LS1-1) <p>.....</p> <p>Connections to Nature of Science</p> <p>Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> Science findings are based on recognizing patterns. (3-LS1-1) 	<p>LS1.B: Growth and Development of Organisms</p> <ul style="list-style-type: none"> Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns of change can be used to make predictions. (3-LS1-1)

3-LS1 From Molecules to Organisms: Structures and Processes

California Environmental Principles and Concepts aligned to the CA NGSS: (3-LS1-1)

Principle III: Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-bands: **MS.LS1.B** (3-LS1-1)

California Common Core State Standards Connections:

ELA/Literacy –

RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)

SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)

Mathematics –

MP.4 Model with mathematics. (3-LS1-1)

3.NBT.1–3 Use place value understanding and properties of operations to perform multi-digit arithmetic. (3-LS1-1)

3.NF.1–3 Develop understanding of fractions as numbers. (3-LS1-1)

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3-LS2 Ecosystems: Interactions, Energy, and Dynamics

3-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

3-LS2-1. Construct an argument that some animals form groups that help members survive.

The performance expectation(s) above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> Construct an argument with evidence, data, and/or a model. (3-LS2-1) 	<p>LS2.D: Social Interactions and Group Behavior</p> <ul style="list-style-type: none"> Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (Note: Moved from K–2.) (3-LS2-1) 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-bands: **1.LS1.B** (3-LS2-1); **MS.LS2.A** (3-LS2-1)

California Common Core State Standards Connections:

ELA/Literacy –

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS2-1)

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS2-1)

W.3.1.a–d Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS2-1)

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-LS4-1)

Mathematics –

MP4 Model with mathematics. (3-LS2-1)

3.NBT.1–3 Use place value understanding and properties of operations to perform multi-digit arithmetic. (3-LS2-1)

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The section titled “Disciplinary Core Ideas” is reproduced verbatim from *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*.

3-LS3 Heredity: Inheritance and Variation of Traits

3-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

- 3-LS3-1.** Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]
- 3-LS3-2.** Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and a pet dog that is given too much food and little exercise may become overweight.]

The performance expectation(s) above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</p> <ul style="list-style-type: none"> Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) <p>Constructing Explanations and Designing Solutions 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.</p> <ul style="list-style-type: none"> Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) 	<p>LS3.A: Inheritance of Traits</p> <ul style="list-style-type: none"> Many characteristics of organisms are inherited from their parents. (3-LS3-1) Other characteristics result from individuals’ interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2) <p>LS3.B: Variation of Traits</p> <ul style="list-style-type: none"> Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1) The environment also affects the traits that an organism develops. (3-LS3-2) 	<p>Patterns</p> <ul style="list-style-type: none"> Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) <p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)

California Environmental Principles and Concepts aligned to the CA NGSS: (3-LS3-2)

Principle II: The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

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3-LS3 Heredity: Inheritance and Variation of Traits

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-bands: **1.LS3.A** (3-LS3-1); **1.LS3.B** (3-LS3-1); **MS.LS1.B** (3-LS3-2); **MS.LS3.A** (3-LS3-1); **MS.LS3.B** (3-LS3-1)

California Common Core State Standards Connections:

ELA/Literacy –

- RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS3-1), (3-LS3-2)
- RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS3-1), (3-LS3-2)
- RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS3-1), (3-LS3-2)
- W.3.2.a–d** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1), (3-LS3-2)
- SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
- a. Plan and deliver an informative/explanatory presentation on a topic that: organizes ideas around major points of information, follows a logical sequence, includes supporting details, uses clear and specific vocabulary, and provides a strong conclusion. **CA** (3-LS3-1), (3-LS3-2)

Mathematics –

- MP.2** Reason abstractly and quantitatively. (3-LS3-1), (3-LS3-2)
- MP.4** Model with mathematics. (3-LS3-1), (3-LS3-2)
- 3.MD.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3-LS3-1), (3-LS3-2)

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3-LS4 Biological Evolution: Unity and Diversity

3-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

- 3-LS4-1.** Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. *[Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]*
- 3-LS4-2.** Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. *[Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]*
- 3-LS4-3.** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. *[Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]*
- 3-LS4-4.** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.* *[Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]*

The performance expectation(s) above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</p> <ul style="list-style-type: none"> Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1) 	<p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</p> <ul style="list-style-type: none"> When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4) <p>LS4.A: Evidence of Common Ancestry and Diversity</p> <ul style="list-style-type: none"> Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (Note: Moved from K–2.) (3-LS4-1) 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified and used to explain change. (3-LS4-2), (3-LS4-3) <p>Scale, Proportion, and Quantity</p> <ul style="list-style-type: none"> Observable phenomena exist from very short to very long time periods. (3-LS4-1) <p>Systems and System Models</p> <ul style="list-style-type: none"> A system can be described in terms of its components and their interactions. (3-LS4-4)

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3-LS4 Biological Evolution: Unity and Diversity

Constructing Explanations and Designing Solutions
 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.

- Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)

Engaging in Argument from Evidence
 Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence. (3-LS4-3)
- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)

- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1)

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

LS4.C: Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

LS4.D: Biodiversity and Humans

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

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Connections to Engineering, Technology, and Applications of Science

Interdependence of Engineering, Technology and Applications of Science on Society and the Natural World

- Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-4)

.....
Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (3-LS4-1)

California Environmental Principles and Concepts aligned to the CA NGSS: (3-LS4-2), (3-LS4-3), (3-LS4-4)
Principle II: The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

Connections to other DCIs in third grade: 3.ESS2.D (3-LS4-3); 3.ESS3.B (3-LS4-4)

Articulation of DCIs across grade-bands: K.ESS3.A (3-LS4-3), (3-LS4-4); K.ETS1.A (3-LS4-4); 1.LS3.B (3-LS4-2); 2.LS2.A (3-LS4-3), (3-LS4-4); 2.LS4.D (3-LS4-3), (3-LS4-4); 4.ESS1.C (3-LS4-1); 4.ESS3.B (3-LS4-4); 4.ETS1.A (3-LS4-4); MS.LS2.A (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4); MS.LS2.C (3-LS4-4); MS.LS3.B (3-LS4-2); MS.LS4.A (3-LS4-1); MS.LS4.B (3-LS4-2), (3-LS4-3); MS.LS4.C (3-LS4-3), (3-LS4-4); MS.ESS1.C (3-LS4-1), (3-LS4-3), (3-LS4-4); MS.ESS2.B (3-LS4-1); MS.ESS3.C (3-LS4-4)

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3-LS4 Biological Evolution: Unity and Diversity

California Common Core State Standards Connections:

ELA/Literacy –

- RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- W.3.1.a-d** Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS4-1), (3-LS4-3), (3-LS4-4)
- W.3.2.a-d** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-LS4-1)
- SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
- a. Plan and deliver an informative/explanatory presentation on a topic that: organizes ideas around major points of information, follows a logical sequence, includes supporting details, uses clear and specific vocabulary, and provides a strong conclusion. **CA** (3-LS4-2), (3-LS4-3), (3-LS4-4)

Mathematics –

- MP.2** Reason abstractly and quantitatively. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- MP.4** Model with mathematics. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- MP.5** Use appropriate tools strategically. (3-LS4-1)
- 3.MD.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets. (3-LS4-2), (3-LS4-3)
- 3.MD.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3-LS4-1)

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3-ESS2 Earth's Systems

3-ESS2 Earth's Systems

Students who demonstrate understanding can:

- 3-ESS2-1.** Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. *[Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]*
- 3-ESS2-2.** Obtain and combine information to describe climates in different regions of the world.

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Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</p> <ul style="list-style-type: none"> Represent data in tables and various graphical displays (bar graphs, pictographs) to reveal patterns that indicate relationships. (3-ESS2-1) <p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.</p> <ul style="list-style-type: none"> Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2) 	<p>ESS2.D: Weather and Climate</p> <ul style="list-style-type: none"> Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1) Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns of change can be used to make predictions. (3-ESS2-1), (3-ESS2-2)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-bands: **K.ESS2.D** (3-ESS2-1); **4.ESS2.A** (3-ESS2-1); **5.ESS2.A** (3-ESS2-1); **MS.ESS2.C** (3-ESS2-1), (3-ESS2-2); **MS.ESS2.D** (3-ESS2-1), (3-ESS2-2)

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3-ESS2 Earth's Systems

California Common Core State Standards Connections:

ELA/Literacy –

- RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2)
- RI.3.9** Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)
- W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Mathematics –

- MP.2** Reason abstractly and quantitatively. (3-ESS2-1), (3-ESS2-2)
- MP.4** Model with mathematics. (3-ESS2-1), (3-ESS2-2)
- MP.5** Use appropriate tools strategically. (3-ESS2-1)
- 3.MD.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-ESS2-1)
- 3.MD.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets. (3-ESS2-1)

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3-ESS3 Earth and Human Activity

3-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

- 3-ESS3-1.** Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.* [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]

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Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1) 	<p>ESS3.B: Natural Hazards</p> <ul style="list-style-type: none"> A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.) 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1) <p style="text-align: center;">.....</p> <p style="text-align: center;">Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seat-belts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1) <p style="text-align: center;">.....</p> <p style="text-align: center;">Connections to Nature of Science</p> <p>Science is a Human Endeavor</p> <ul style="list-style-type: none"> Science affects everyday life. (3-ESS3-1)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-bands: **K.ESS3.B** (3-ESS3-1); **K.ETS1.A** (3-ESS3-1); **4.ESS3.B** (3-ESS3-1); **4.ETS1.A** (3-ESS3-1); **MS.ESS3.B** (3-ESS3-1)

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3-ESS3 Earth and Human Activity

California Common Core State Standards Connections:

ELA/Literacy –

W.3.1.a–d Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. (3-ESS3-1)

MP.4 Model with mathematics. (3-ESS3-1)

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3-PS2 Motion and Stability: Forces and Interactions

3-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

- 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. *[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.]*
- 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. *[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.]*
- 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 Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]*
- 3-PS2-4.** Define a simple design problem that can be solved by applying scientific ideas about magnets.* *[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.]*

The performance expectation(s) above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.</p> <ul style="list-style-type: none"> Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4) 	<p>PS2.A: Forces and Motion</p> <ul style="list-style-type: none"> 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) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns of change can be used to make predictions. (3-PS2-2) <p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified. (3-PS2-1) Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)

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3-PS2 Motion and Stability: Forces and Interactions

Planning and Carrying Out Investigations

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.

- 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)
- 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)

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Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (3-PS2-2)

Scientific Investigations Use a Variety of Methods

- Science investigations use a variety of methods, tools, and techniques. (3-PS2-1)

- 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)

PS2.B: Types of Interactions

- Objects in contact exert forces on each other. (3-PS2-1)
- 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), (3-PS2-4)

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Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- 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)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-bands: **K.PS2.A** (3-PS2-1); **K.PS2.B** (3-PS2-1); **K.PS3.C** (3-PS2-1); **K.ETS1.A** (3-PS2-4); **1.ESS1.A** (3-PS2-2); **4.PS4.A** (3-PS2-2); **4.ETS1.A** (3-PS2-4); **5.PS2.B** (3-PS2-1); **MS.PS2.A** (3-PS2-1), (3-PS2-2); **MS.PS2.B** (3-PS2-3), (3-PS2-4); **MS.ESS1.B** (3-PS2-1), (3-PS2-2); **MS.ESS2.C** (3-PS2-1)

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3-PS2 Motion and Stability: Forces and Interactions

California Common Core State Standards Connections:

ELA/Literacy –

- RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-PS2-1), (3-PS2-3)
- RI.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-PS2-3)
- RI.3.8** Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence). (3-PS2-3)
- W.3.7** Conduct short research projects that build knowledge about a topic. (3-PS2-1), (3-PS2-2)
- W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-PS2-1), (3-PS2-2)
- SL.3.3** Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)

Mathematics –

- MP.2** Reason abstractly and quantitatively. (3-PS2-1)
- MP.5** Use appropriate tools strategically. (3-PS2-1)
- 3.MD.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-PS2-1)

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3–5-ETS1 Engineering Design

3–5-ETS1 Engineering Design

Students who demonstrate understanding can:

- 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.
- 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.
- 3–5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

The performance expectation(s) above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Asking Questions and Defining Problems Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.</p> <ul style="list-style-type: none"> ▪ 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) <p>Planning and Carrying Out Investigations 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.</p> <ul style="list-style-type: none"> ▪ 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. (3–5-ETS1-3) 	<p>ETS1.A: Defining and Delimiting Engineering Problems</p> <ul style="list-style-type: none"> ▪ 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) <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> ▪ 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) ▪ 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) ▪ Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3–5-ETS1-3) 	<p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> ▪ People’s needs and wants change over time, as do their demands for new and improved technologies. (3–5-ETS1-1) ▪ Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3–5-ETS1-2)

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3–5-ETS1 Engineering Design

Constructing Explanations and Designing Solutions

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.

- 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)

ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3–5-ETS1-3)

California Environmental Principles and Concepts aligned to the CA NGSS: (3-5-ETS1-1), (3-5-ETS1-2)

Principle V: Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

Connections to other DCIs in this grade-band:

Connections to 3–5-ETS1.A: Defining and Delimiting Engineering Problems include:

Fourth Grade: 4-PS3-4

Connections to 3–5-ETS1.B: Designing Solutions to Engineering Problems include:

Fourth Grade: 4-ESS3-2

Connections to 3–5-ETS1.C: Optimizing the Design Solution include:

Fourth Grade: 4-PS4-3

Articulation of DCIs across grade-bands: K-2.ETS1.A (3–5-ETS1-1), (3–5-ETS1-2), (3–5-ETS1-3); K-2.ETS1.B (3–5-ETS1-2); K-2.ETS1.C (3–5-ETS1-2), (3–5-ETS1-3); MS.ETS1.A (3–5-ETS1-1); MS.ETS1.B (3–5-ETS1-1), (3–5-ETS1-2), (3–5-ETS1-3); MS.ETS1.C (3–5-ETS1-2), (3–5-ETS1-3)

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3–5-ETS1 Engineering Design

California Common Core State Standards Connections:

ELA/Literacy –

- RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3–5-ETS1-2)
- RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3–5-ETS2)
- RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3–5-ETS1-2)
- W.5.7** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3–5-ETS1-1), (3–5-ETS1-3)
- W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3–5-ETS1-1), (3–5-ETS1-3)
- W.5.9.a-b** Draw evidence from literary or informational texts to support analysis, reflection, and research. (3–5-ETS1-1), (3–5-ETS1-3)

Mathematics –

- MP.2** Reason abstractly and quantitatively. (3–5-ETS1-1), (3–5-ETS1-2), (3–5-ETS1-3)
- MP.4** Model with mathematics. (3–5-ETS1-1), (3–5-ETS1-2), (3–5-ETS1-3)
- MP.5** Use appropriate tools strategically. (3–5-ETS1-1), (3–5-ETS1-2), (3–5-ETS1-3)
- 3.OA.1–4** Represent and solve problems involving multiplication and division. (3–5-ETS1-1), (3–5-ETS1-2)
- 3.OA.5–6** Understand properties of multiplication and the relationship between multiplication and division. (3–5-ETS1-1), (3–5-ETS1-2)
- 3.OA.7** Multiply and divide within 100. (3–5-ETS1-1), (3–5-ETS1-2)
- 3.OA.8-9** Solve problems involving the four operations, and identify and explain patterns in arithmetic. (3–5-ETS1-1), (3–5-ETS1-2)
- 4.OA.1–3** Use the four operations with whole numbers to solve problems. (3–5-ETS1-1), (3–5-ETS1-2)
- 4.OA.4** Gain familiarity with factors and multiples. (3–5-ETS1-1), (3–5-ETS1-2)
- 4.OA.5** Generate and analyze patterns. (3–5-ETS1-1), (3–5-ETS1-2)
- 5.OA.1–2.1** Write and interpret numerical expressions. (CA) (3–5-ETS1-1), (3–5-ETS1-2)
- 5.OA.3** Analyze patterns and relationships. (3–5-ETS1-1), (3–5-ETS1-2)

California Department of Education, June 2021

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