A Correlation of

Interactive Science
Grades 3-5
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To the

2014 Oregon Science Standards (NGSS)
Oregon Department of Education Standards
Arranged by Disciplinary Core Ideas
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Students who demonstrate understanding can:

3-L51-1. 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.]

Chapters 3, 4, 5 Performance Expectation Activity, 245a

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing and Using Models</td>
<td>LS1.B: Growth and Development of Organisms</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Develop models to describe phenomena. (3-L51-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 138, At-Home Lab; 245, Life Cycle Poster; 312, Models</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TE Only:</strong> 101, SEP: Developing and Using Models; 179, 21st Century Learning; 245a, Performance Expectation Activity; 245a, ELA/Literacy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Patterns**
- Patterns of change can be used to make predictions. (3-L51-1)

**SE/TE:** 102, Try It!; 104-107, STEM Activity; 133, Do the Math!; 136, Life Cycle of a Flowering Plant; 176, Explore It!; 176-183, Lesson; 186, STEM: Shark Tracking;

**TE Only:** 100, CCC: Patterns; 136, 21st Century Learning; 137, Science Notebook; 139, Professional Development Note; 176, Lab Support

**Connections to Nature of Science**

**Scientific Knowledge is Based on Empirical Evidence**
- Science findings are based on recognizing patterns. (3-L51-1)

**SE/TE:** 102, Try It!; 136, Life Cycle of a Flowering Plant; 137, Life Cycle of a Conifer Plant; 184-185, Investigate It!

**TE Only:** 152, CCC: Patterns; 245a, Performance Expectation Activity

**Connections to other DCIs in third grade:** N/A

**Articulation of DCIs across grade-bands:** MS.LS1.B (3-L51-1)

**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-L51-1)

**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-L51-1)

**Mathematics** –

**MP.4** Model with mathematics. (3-L51-1)

**3.NBT** Number and Operations in Base Ten (3-L51-1)

**3.NF** Number and Operations—Fractions (3-L51-1)
### 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.**

Chapter 5 Performance Expectation Activity, 245f

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engaging in Argument from Evidence</strong></td>
<td><strong>LS2.D: Social Interactions and Group Behavior</strong>&lt;br&gt;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 (<em>Note: Moved from K–2</em>). (3-LS2-1)</td>
<td><strong>Cause and Effect</strong>&lt;br&gt;Causes and effect relationships are routinely identified and used to explain change. (3-LS2-1)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 216, Explore It!; 244, Animals and Seasons; 245, Matching Traits</td>
<td><strong>SE/TE:</strong> 208, Groups Within Ecosystems; 219, Do the Math</td>
<td><strong>SE/TE:</strong> 199, Let’s Read Science; 210, Explore It!; 216-217, Envision It!; 215, Lightning Lab; 216, Explore It!; 216-223, Lesson 3;</td>
</tr>
<tr>
<td><strong>TE Only:</strong> xlv-xlvi, STEMQuest; 197, SEP: Engaging in Argument from Evidence; 223a, Explore It!; 245f, Performance Expectation Activity; 245g, Performance Expectation Activity; 245g, ELA/Literacy</td>
<td><strong>TE Only:</strong> xlv-xlvi, STEMQuest; 197, SEP: Engaging in Argument from Evidence; 223a, Explore It!; 245f, Performance Expectation Activity; 245g, ELA/Literacy</td>
<td><strong>TE Only:</strong> xlv-xlvi, STEMQuest; 215, Differentiated Instruction; 215a, Explore It!; 215b, Lesson 2 Check – Question 6; 223a, Explore It!; 223b, Lesson 3 Check – Questions 4, 5; 245h, Performance Expectation Activity; 245h, ELA/Literacy</td>
</tr>
</tbody>
</table>

**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)

**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** Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS2-1)
- **W.3.9** 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 –**

- **MP.4** Model with mathematics. (3-LS2-1)
- **3.NBT** Number and Operations in Base Ten (3-LS2-1)
### 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.]  
Chapter 3 and 4 Performance Expectation Activity, 245c

**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.]  
Chapter 4 Performance Expectation Activity, 245d

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzing and Interpreting Data</strong></td>
<td><strong>LS3.A: Inheritance of Traits</strong></td>
<td><strong>Patterns</strong></td>
</tr>
<tr>
<td>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.</td>
<td>• Many characteristics of organisms are inherited from their parents. (3-LS3-1)</td>
<td>• Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 162, Science Notebook; 164; Lightning Lab; 170, At-Home Lab; <strong>TE Only:</strong> 153, SEP: Analyzing and Interpreting Data; 175, 21st Century Learning; 245c, Performance Expectation Activity; 245c, ELA/Literacy</td>
<td><strong>SE/TE:</strong> 129, Reproduction; 168, My Planet Diary; 161-167, Lesson 1; 169, Both Alike and Different; 170, Inherited Characteristics; 172, Inherited Behavior; 192, Chapter Review – Question 6; 194, Benchmark Practice – Questions 2, 5; 245, Matching Traits</td>
<td><strong>SE/TE:</strong> 135, Science Careers; 154, Try It!; 161-167, Lesson 1; 170, At-Home Lab; 184-185, Investigate It!; 195, Science in Your Backyard, 245, Matching Traits</td>
</tr>
<tr>
<td><strong>Constructing Explanations and Designing Solutions</strong></td>
<td><strong>SE/TE:</strong> 167b, Lesson 1 Check; 168, Professional Development Note; 172, 21st Century Learning; 175a, My Planet Diary; 175b, Lesson 2 Check – Question 3; 193a-193b, Chapter 4 Test; 245c, Performance Expectation Activity</td>
<td><strong>TE Only:</strong> 152, CCC: Patterns; 170, Differentiated Instruction; 176, Explore It!; 185c, Guided Inquiry; 245c, Performance Expectation Activity</td>
</tr>
<tr>
<td>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.</td>
<td>• 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)</td>
<td><strong>Cause and Effect</strong></td>
</tr>
<tr>
<td>Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)</td>
<td><strong>SE/TE:</strong> 171, Acquired Characteristics; 172, Inherited Behavior; 173, Learned Behavior; 175, Got It? – Question 12; 192, Chapter Review – Questions 5, 6</td>
<td>• Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 102, Try It!; 106, Test the Prototype; 107, Communicate Results; 116, Explore It!; 176, Explore It!; 307, Interpret and Explain Data; 328, Observe Insect Behavior</td>
<td><strong>TE Only:</strong> 171, Science Notebook; 173, Science Notebook; 175b, Lesson 2 Check – Questions 4, 6; 182, Elaborate; 193a-193b, Chapter 4 Test – Questions 2, 7, 10; 245d, Performance Expectation Activity; 245d, ELA/Literacy</td>
<td><strong>SE/TE:</strong> 116, Explore It!; 171, Acquired Characteristics; 174-175, Small Differences in Traits; 244, Animals and Seasons</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 121a, Explore It!; 183a, Explore It!; 245b, Performance Expectation Activity; 245d, Performance Expectation Activity; 245g, Performance Expectation Activity; 245g, ELA/Literacy</td>
<td><strong>TE Only:</strong> 121b, Lesson 2 Check – Question 5; 171, Demonstrate/Decide; 171, Science Notebook; 174, Conclude/Execute; 174, Professional Development Note; 245b, Performance Expectation Activity; 245b, ELA/Literacy; 245d, ELA/Literacy</td>
<td><strong>SE/TE:</strong> 174, Conclude/Execute; 174, Professional Development Note; 245b, Performance Expectation Activity; 245b, ELA/Literacy; 245d, ELA/Literacy</td>
</tr>
</tbody>
</table>
### LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)

**SE/TE:** 169, Both Alike and Different; 174-175, Small Differences in Traits

**TE Only:** 174, Professional Development Note; 175, 21st Century Learning; 245c, Performance Expectation Activity; 245c, ELA/Literacy

- The environment also affects the traits that an organism develops. (3-LS3-2)

**SE/TE:** 171, Acquired Characteristics; 173, Learned Behaviors; 245, Matching Traits

**TE Only:** 245d, Performance Expectation Activity; 245d, ELA/Literacy

#### Connections to other DCIs in third grade:
N/A

#### Articulation of DCIs across grade-bands:

1. **LS3.A (3-LS3-1); LS3.B (3-LS3-1); LS3.1.B (3-LS3-2); MS.LS3.A (3-LS3-1); MS.LS3.B (3-LS3-1)**

#### Common Core State Standards Connections:

<table>
<thead>
<tr>
<th>ELA/Literacy –</th>
<th>RI.3.1</th>
<th>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)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RI.3.2</td>
<td>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)</td>
</tr>
<tr>
<td></td>
<td>RI.3.3</td>
<td>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)</td>
</tr>
<tr>
<td></td>
<td>W.3.2</td>
<td>Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1),(3-LS3-2)</td>
</tr>
<tr>
<td></td>
<td>SL.3.4</td>
<td>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. (3-LS3-1),(3-LS3-2)</td>
</tr>
</tbody>
</table>

| 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.B.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) |
### 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.

Chapter 5 Performance Expectation Activity, 245e

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.

Chapter 4 Performance Expectation Activity, 245b

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.

Chapter 5 Performance Expectation Activity, 245g

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.

Chapters 3 and 5 Performance Expectation Activity, 245h

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
</table>
| **Analyzing and Interpreting Data** | **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**
- 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)
| **SE/TE:** 224, Explore It!; 227, Lightning Lab; 228-229, Investigate It!; 342-345, STEM Activity
**TE Only:** 227, Differentiated Instruction; 245e, Performance Expectation Activity; 245e, ELA/Literacy; 245f, ELA/Literacy | **Cause and Effect**
- Cause and effect relationships are routinely identified and used to explain change. (3-LS4-2),(3-LS4-3) |
| **Conducting Explanations and Designing Solutions**
Conducting explanations and designing solutions 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.
- **Analyse and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1)**
| **SE/TE:** 209, Ecosystems Change; 215, Changes in Food Webs; 216-223, Lesson 3; 230, Field Trip; 237, Chapter Review – Lesson 3; 238, Benchmark Practice, Question 3
**TE Only:** xlvii-xliv, STEMQuest; 196G-196H, Leveled Content Reader Support; 196, Professional Development Note; 215, Differentiated Instruction; 219, 21st Century Learning; 223a, Explore It!; 223b, Lesson 3 Check- Questions 4, 5, 230, Professional Development Note; 237a-237b, Chapter 5 Test – Questions 6, 8, 9; 245h, Performance Expectation Activity | **SE/TE:** 116, Explore It!; 171, Acquired Characteristics; 174-175, Small Differences in Traits; 244, Animals and Seasons
**TE Only:** 121a, Explore!; 121b, Lesson 2 Check – Question 5; 171, Demonstrate/Decide; 171, Science Notebook; 174, Conclude/Execute; 174, Professional Development Note; 245b, Performance Expectation Activity; 245b, ELA/Literacy; 245d, ELA/Literacy |
| **Conducting Explanations and Designing Solutions**
Conducting 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.**

**SE/TE:** 199, Let’s Read Science; 210, Explore It!; 216-217, Envision It!; 215, Lightning Lab; 216, Explore It!; 216-223, Lesson 3; | **TE Only:** xlvii-xliv, STEMQuest; 215, Differentiated Instruction; 215a, Explore It!; 215b, Lesson 2 Check – Question 6; 223a, Explore It!; 223b, Lesson 3 Check – Questions 4, 5; 245h, Performance Activity |
### Grade 3-5

**2014 Oregon Science Standards (NGSS)**

**Standards Arranged by Disciplinary Core Ideas**

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**LS4.A: Evidence of Common Ancestry and Diversity**
- Some kinds of plants and animals that once lived on Earth are no longer found anywhere. *(Note: moved from K-2)* (3-LS4-1)

**SE/TE:** 225, Fossils; 237, Chapter Review – Question 10

**TE Only:** 219, 21st Century Learning; 227b, Lesson 4 Check - Question 2
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1)

**SE/TE:** 224-227, Lesson 4; 237, Chapter Review – Lesson 4; 238, Benchmark Practice – Question 6

**TE Only:** 227, Differentiated Instruction; 227a, Explore It!; 227b, Lesson 4 Check – Questions 1-5; 237b, Chapter 5 Test – Question 10; 245e, Performance Expectation Activity; 245e, ELA/Literacy; 245e, Mathematics

**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)

**SE/TE:** 170, Inherited Characteristics; 171, Acquired Characteristics; 174-175, Small Differences in Traits

**TE Only:** 174, Science –Writing; 174, Professional Development Note; 175, 21st Century Learning; 245b, Performance Expectation Activity; 245c, Performance Expectation Activity

**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)

**SE/TE:** 217, Ecosystem Change; 221, Seasonal Change; 228-229, Investigate It!; 237, Chapter Review – Lesson 4; 239, Science Careers; 240-243, Apply It!; 244, Germinating Seeds/Animals and Seasons

**TE Only:** 196C, Adaptations; 196D, Plant Adaptations/Trees During the Seasons/Grasslands; 196G-196H, Leveled Content Reader Support; 229a-229d, Activity Card Support; 245b, Performance Expectation Activity; 245g, Performance Expectation Activity; 245g, ELA/Literacy

### Connections to Engineering, Technology, and Applications of Science

**Interdependence of Science, Engineering, and Technology**
- Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-3)

**SE/TE:** 156-159, STEM Activity; 200-203, STEM Activity; 204, My Planet Diary; 216, Explore It!; 239, Science Careers; 342-345, STEM Activity; 346-349, Lesson 1

**TE Only:** xlvii, STEMQuest; 196G-196H, Leveled Content Reader Support; 196, CCC: Systems and System Models; 209b, Lesson 1 Check – Questions 1-7; 229a-229d, Activity Card Support; 237a, Chapter 5 Test – Question 1

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*DOPTED BY THE BOARD OF EDUCATION 3/6/14*

*OFFICE OF LEARNING*
### 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)

**SE/TE:** 205, Places for Living Things; 208, Habitats; 209, At-Home Lab; 219, Do the Math; 220, Natural Events Cause Change; 222-223, Living Things Return; 238, Benchmark Practice – Question 3

**TE Only:** 156-157, Background; 196G-196H, Leveled Content Reader Support; 196, Professional Development Note; 237b, Chapter 5 Test – Question 9; 245h, Performance Expectation Activity; 245h, ELA/Literacy

### 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)

**SE/TE:** 225, Fossils; 226-227, What Fossils Show; 237, Chapter Review – Question 10; 238; Benchmark Practice – Question 6; 245, Matching Traits

**TE Only:** 227, Differentiated Instruction; 237b, Chapter 5 Test – Question 10; 245e, Performance Expectation Activity

**Science is a Human Endeavor**
- Most scientists and engineers work in teams. (3-LS4-3)

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

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

### 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-LS4-4)
- 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-LS4-4)
- 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)
- Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS4-1), (3-LS4-2), (3-LS4-4)
- Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-2), (3-LS4-4)
- 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)
- 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. (3-LS4-2), (3-LS4-4)

**Mathematics – MP.2**
- Reason abstractly and quantitatively. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- Model with mathematics. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- Use appropriate tools strategically. (3-LS4-1)

**3.MD.B.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.B.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)
### 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 at this grade level 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.]

Chapter 6 Performance Expectation Activity, 289a

**3-ESS2-2.** Obtain and combine information to describe climates in different regions of the world.

Chapter 6 Performance Expectation Activity, 289b

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Analyzing and Interpreting Data</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzing and Interpreting Data</strong></td>
<td><strong>ESS2.D:</strong> Weather and Climate</td>
<td><strong>Patterns</strong></td>
</tr>
<tr>
<td>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.</td>
<td>▪ 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)</td>
<td>▪ Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 258, Explore It!; 268, Lightning Lab; 276–277, Investigate It!; 289, Measure Rainfall; 306, Do the Math</td>
<td><strong>SE/TE:</strong> 258, Explore It!; 259, Weather; 260–261, Climate; 266–269, Lesson 3; 282, Chapter Review – Lesson; 283, Chapter Review – Lesson 3; 284, Benchmark Practice – Question 2; 289, Measure Rainfall; 303, Science Skills; 307, Interpret and Explain Data</td>
<td><strong>TE Only:</strong> 248, Try It!; 258, Explore It!; 269, Predict; 283, Chapter Review – Lesson 3</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 247, SEP: Analyzing and Interpreting Data; 265a, Explore It!; 277a–277d, Activity Card Support; 289a, Performance Expectation Activity; 289a, Mathematics; 319a, Explore It!</td>
<td><strong>TE Only:</strong> 246G-246H, Leveled Content Reader Support; 246, Predict; 265a, Explore It!; 265b, Lesson 2 Check – Questions 1, 4; 269a, Explore It!; 269b, Lesson 3 Check – Questions 3, 4; 283a, Chapter 6 Test – Question 4; 283b, Chapter 6 Test – Question 10</td>
<td><strong>TE Only:</strong> 246D, Under Pressure; 246G-246H, Leveled Content Reader Support; 246, CCC: Patterns; 265a, Explore It!; 269, Science Notebook; 289a, Performance Expectation Activity; 289b, Performance Expectation Activity</td>
</tr>
</tbody>
</table>

| Obtaining, Evaluating, and Communicating Information | **SE/TE:** 250-253, STEM Activity; 358, Do Research | **SE/TE:** 254, My Planet Diary; 260-261, Climate; 262-263, Factors That Affect Climate; 264-265, Seasonal Weather Patterns; Chapter Review – Lesson 2; 284, Benchmark Practice – Questions 1, 3 |
| 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. | **TE Only:** 254, 21st Century Learning; 261, 21st Century Learning; 262, Differentiated Instruction – Advanced; 289a, Performance Expectation Activity; 289b, Performance Expectation Activity; 289b, ELA/Literacy; 289c, Performance Expectation Activity; 289c, ELA/Literacy | **TE Only:** 246D, Climate Classification/Did You Know? (CloudSat); 246G-246H, Leveled Content Reader Support; 260, Professional Development Note; 261, Science Notebook; 265b, Lesson 2 Check – Questions 2, 3; 283a, Chapter 6 Test – Question 3; 283b, Chapter 6 Test – Questions 3, 9; 289b, Performance Expectation Activity |

*Connections to other DCIs in third grade: N/A*
### Articulation of DCIs across grade-bands:

- **MS.ESS2.D** (3-ESS2-1), **(3-ESS2-2)**

### 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.A.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.B.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. (3-ESS2-1) |
### 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.]*  
Chapter 6 Performance Expectation Activity, 289c

The performance expectations 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**

<table>
<thead>
<tr>
<th>Engaging in Argument from Evidence</th>
<th>ESS3.B: Natural Hazards</th>
<th>Cause and Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>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).</td>
<td>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) <em>(Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)</em></td>
<td>- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1)</td>
</tr>
<tr>
<td>• 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)</td>
<td></td>
<td>- SE/TE: 248, Try It!; 250-253, STEM Activity; 256-257, Water Cycle; 262-263, Factors That Affect Climate; 288, Make a Booklet</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 250-253, STEM Activity; 361, Evaluate and Redesign; 362-363, Investigate It!</td>
<td><strong>SE/TE:</strong> 249, Let’s Read Science; 250-253, STEM Activity; 270-275, Lesson 4; 283, Chapter Review — Lesson 4; 284, Benchmark Practice — Question 6; 288, Make a Poster; 303, Science Skills; 307, Interpret and Explain Data</td>
<td><strong>TE only:</strong> 246C, The Water Cycle; 246, Lab Support; 265b, Lesson 2 Check — Question 5</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 289c, Performance Expectation Activity; 289c, ELA/Literacy; 363a-363d, Activity Card Support</td>
<td><strong>TE Only:</strong> 246G-246H, Leveled Content Reader Support; 250, Background; 275a, Explore It!; 275b, Lesson 4 Check — Questions 1-6; 283a, Chapter 6 Test – Question 5; 289c, Performance Expectation Activity</td>
<td></td>
</tr>
</tbody>
</table>

**Connections to Engineering, Technology, and Applications of Science**

**Influence of Engineering, Technology, and Science on Society and the Natural World**

| Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1) | **SE/TE:** 250-253, STEM Activity; 278, Science Careers; 285, Big World, My World; 346-349, Lesson 1; 359, 356-361, Lesson 3 | **TE Only:** 254, 21st Century Learning; 338: CCC: Influence of Engineering, Technology, and Science on Society and the Natural World |

| **SE/TE:** 250, 21st Century Learning; 338: CCC: Influence of Engineering, Technology, and Science on Society and the Natural World | | |

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**OFFICE OF LEARNING**
### Connections to Nature of Science

**Science is a Human Endeavor**

- Science affects everyday life. (3-ESS3-1)

**SE/TE:** 288, Make a Poster/Make a Booklet; 346-349, Lesson 1

**TE Only:** 246G-246H, Leveled Content Reader Support; 338: CCC: Influence of Engineering, Technology, and Science on Society and the Natural World

### 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)

### Common Core State Standards Connections:

**ELA/Literacy —**

- **W.3.1** 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)

*This performance expectation integrates traditional science content with engineering through a practice or disciplinary core idea.*
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.]
Chapter 1 Performance Expectation Activity, 99a

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 see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]
Chapter 1 Performance Expectation Activity, 99b

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.]
Chapter 1 Performance Expectation Activity, 99c

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.]
Performance-Based Assessment: Solve a Problem, 99
Chapter 1 Performance Expectation Activity, 99d

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking Questions and Defining Problems</td>
<td>PS2.A: Forces and Motion</td>
<td>Patterns</td>
</tr>
<tr>
<td>Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progress to specifying qualitative relationships.</td>
<td>▪ 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.)</td>
<td>▪ Patterns of change can be used to make predictions. (3-PS2-2)</td>
</tr>
<tr>
<td>▪ Ask questions that can be investigated based on patterns such as cause and effect relationships.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE/TE: 99, Plan an Investigation; 300, Questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TE Only: 27d, Open Inquiry; 39, SEP: Asking Questions and Defining Problems; 83d, Open Inquiry; 99c, Performance Expectation Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Define a simple problem that can be solved through the development of a new or improved object or tool.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE/TE: 4-7, STEM Activity; 99, Solve a Problem; 356-361, Lesson 3;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TE Only: 24, 21st Century Learning: 99d, Performance Expectation Activity; 349a, My Planet Diary; 349b, Lesson 1 Check – Questions 3, 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning and Carrying Out Investigations</td>
<td></td>
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</tbody>
</table>

*Clarification Statement: Examples of a magnet are objects that can be manipulated by students and are attracted to each other. Assessment is limited to one variable at a time: number, size, or direction of forces.
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)

**SE/TE:** 4-7, STEM Activity; 14, Explore It!; 22, Explore It!; 26-27, Investigate It!; 99, Plan an Investigation; 314, Lesson 4

**TE Only:** 1, SEP: Planning and Carrying Out Investigations; 21a, Explore It!; 25a, Explore It!; 27a-27d, Activity Card Support; 99a, Performance Expectation Activity

- 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)

**SE/TE:** 10, At-Home Lab; 22, Explore It!; 26-27, Investigate It!; 50, At-Home Lab; 94-97, Apply It!; 99, Plan an Investigation

**TE Only:** 25a, Explore It!; 27a-27d, Activity Card Support; 99b, Performance Expectation Activity; 99b, ELA/Literacy

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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)

**SE/TE:** 10, At-Home Lab; 22, Explore It!; 27, Investigate It!; 50, At-Home Lab; 94-97, Apply It!; 99, Plan an Investigation

**TE Only:** 25a, Explore It!; 27a-27d, Activity Card Support; 99b, Performance Expectation Activity

### Scientific Investigations Use a Variety of Methods

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

**SE/TE:** 4-7, STEM Activity; 14, Explore it!; 16, Lightning Lab, 22, Explore It!; 25, Lightning Lab; 26-27, Investigate It!; 99, Plan an Investigation; 308-313, Lesson 3; 320-325, Lesson 5

**TE Only:** 1, SEP: Planning and Carrying Out Investigations; 21a, Explore It!; 25a, Explore It!; 27a-27d, Activity Card Support; 99a, Performance Expectation Activity

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)

**SE/TE:** 10, At-Home Lab; 12, How Fast Objects Move; 13, Variable Speed; 26-27, Investigate It; 34, Chapter Review - Lesson 1; 94-97, Investigate It!

**TE Only:** 1G-1H, Leveled Content Reader Support; 12, Professional Development Note; 13b, Lesson 1 Check, Questions 2, 5, 6; 25a, Explore It!; 27a-27d, Activity Card Support; 99b, Performance Expectation Activity; 99b, ELA/Literacy

**PS2.B: Types of Interactions**

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

**SE/TE:** 14, Explore It!; 15, Causes of Motion; 16-17, Effects of Mass and Friction; 34, Chapter Review - Lesson 2; 99, Plan an Investigation

**TE Only:** 1G-1H, Leveled Content Reader Support; 21a, Explore It!; 21b, Lesson 2 Check - Question 3; 35a, Chapter 1 Test – Questions 1, 3, 5; 99a, Performance Expectation Activity;

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)

**SE/TE:** 2, Try It!; 15, Causes of Motion; 20-21, Magnetism; 77, Electric Charges

**TE Only:** 21b, Lesson 2 Check, Question 1; 38, CCC: Cause and Effect; 77, Infer; 99c, Performance Expectation Activity; 99c, ELA/Literacy; 99d, Performance Expectation Activity; 99d, Mathematics
Articulation of DCIs across grade bands: **K.PS2.A** (3-PS2-1); **K.PS2.B** (3-PS2-1); **K.PS2.C** (3-PS2-1); **K.ETS1.A** (3-PS2-4); **1.ESS1.A** (3-PS2-2); **4.PS4.A** (3-PS2-2); **4.ESS1.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)

**Common Core State Standards Connections:**

**ELA/Literacy**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RI.3.1</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>RI.3.3</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>RI.3.8</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>W.3.7</strong></td>
<td>Conduct short research projects that build knowledge about a topic. (3-PS2-1),(3-PS2-2)</td>
</tr>
<tr>
<td><strong>W.3.8</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>SL.3.3</strong></td>
<td>Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)</td>
</tr>
</tbody>
</table>

**Mathematics**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MP.2</strong></td>
<td>Reason abstractly and quantitatively. (3-PS2-1)</td>
</tr>
<tr>
<td><strong>MP.5</strong></td>
<td>Use appropriate tools strategically. (3-PS2-1)</td>
</tr>
<tr>
<td><strong>3.MD.A.2</strong></td>
<td>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)</td>
</tr>
</tbody>
</table>
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.

- Heave Ho! STEM Activity, 4-7
- Sun, Light, Energy STEM Activity, 42-45
- Performance-Based Assessment: Solve a Problem, 99
- Watch It Grow! STEM Activity, 104-107
- Bird Feather Cleaning STEM Activity, 156-159
- Nothing Like a Habitat STEM Activity, 200-203
- Runaway Water! STEM Activity, 250-253
- Chapter 6 Performance Expectation Activity, 289c
- Can You Hear Me? STEM Activity, 294-297
- Bird Food Is Served! STEM Activity, 342-345
- Design It! Which parachute design works best?, 374-379

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.

- Heave Ho! STEM Activity, 4-7
- Sun, Light, Energy STEM Activity, 42-45
- Watch It Grow! STEM Activity, 104-107
- Bird Feather Cleaning STEM Activity, 156-159
- Can You Hear Me? STEM Activity, 294-297
- Try It! How can you design a parachute?, 340
- Bird Food Is Served! STEM Activity, 342-345
- Design It! Which parachute design works best?, 374-379

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.

- Heave Ho! STEM Activity, 4-7
- Sun, Light, Energy STEM Activity, 42-45
- Try It! How can you design a parachute?, 340
- Bird Food Is Served! STEM Activity, 342-345
- Explore It! Which design transfers sound best?, 356
- Design It! Which parachute design works best?, 374-379

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.</td>
<td>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)</td>
<td>People’s needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)</td>
</tr>
<tr>
<td>SE/TE: 4, Identify the Problem; 42, Identify the Problem; 104, Identify the Problem; 156, Identify the Problem; 200, Identify the Problem; 250, Identify the Problem; 294, Identify the Problem; 342, Identify the Problem; 358, Identify the Problem; 374, Identify the Problem</td>
<td></td>
<td>SE/TE: 28, The Wright Brothers; 198, Try It!; 337, Cary Fowler; 346, My Planet Diary; 348-349, Scientific Discoveries and Technology; 359, 21st Century Learning; 361, Evaluate and Redesign</td>
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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. (3-5-ETS1-1)

**SE/TE:** 4–7, STEM Activity; 42–45, STEM Activity; 104–107; 156–159, STEM Activity; 200–203, STEM Activity; 250–253, STEM Activity; 294–297, STEM Activity; 342–345, STEM Activity; 357–361, Design Process; 374–379, Design It!

**TE Only:** 339, SEP: Constructing Explanations and Designing Solutions

### 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)

**SE/TE:** 4–7, STEM Activity; 42–45, STEM Activity; 104–107; 156–159, STEM Activity; 200–203, STEM Activity; 250–253, STEM Activity; 294–297, STEM Activity; 342–345, STEM Activity; 357–361, Design Process; 374–379, Design It!

**TE Only:** 339, SEP: Constructing Explanations and Designing Solutions

### Evaluation of Solutions

Examine the strengths of solutions to design problems. (3–5-ETS1–2)

**SE/TE:** 4–5, Do Research; 42, Do Research; 104–105, Do Research; 156–157, Do Research; 200–201, Do Research; 250–251, Do Research; 294–295, Do Research; 342–343, Do Research; 358, Do Research; 374, Do Research

**TE Only:** 55, 21st Century Learning

- 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)

**SE/TE:** 7, Question 14; 107, Communicate Results; 345, Question 14

**TE Only:** 5, Pre-Activity Discussion; 6, Post-Activity Discussion; 43, Pre-Activity Discussion; 44, Post-Activity Discussion; 105, Pre-Activity Discussion; 106, Post-Activity Discussion; 157, Pre-Activity Discussion; 158, Post-Activity Discussion; 201, Pre-Activity Discussion; 202, Post-Activity Discussion; 251, Pre-Activity Discussion; 252, Post-Activity Discussion; 295, Pre-Activity Discussion; 296, Post-Activity Discussion; 343, Pre-Activity Discussion; 344, Post-Activity Discussion

**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)**

**SE/TE:** 6–7, Test the Prototype; 44–45, Test the Prototype; 106, Test the Prototype; 158, Test the Prototype; 203, Test the Prototype; 252, Test the Prototype; 296, Test the Prototype; 345, Test the Prototype; 378, Test the Prototype

**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)

**SE/TE:** 7, Evaluate and Redesign; 45, Evaluate and Redesign; 107, Evaluate and Redesign; 159, Evaluate and Redesign; 203, Evaluate and Redesign; 252–253, Evaluate and Redesign; 297, Evaluate and Redesign; 345, Evaluate and Redesign; 361, Evaluate and Redesign; 379, Evaluate and Redesign

**Connections to other DCIs in this grade-band:**

- **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)**

**ST**

- **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. (3-5-ETS1-2)**

**SE/TE:** 28, The Wright Brothers; 84, Electrical Engineer; 341, Let’s Read Science; 346–349, Lesson 1; 359, Develop Possible Solutions; 364, Lawn Mowers

**TE Only:** 290, CCC: Influence of Engineering, Technology, and Science on Society and the Natural World; 349a, My Planet Diary

**DOPTED BY THE OREGON STATE BOARD OF EDUCATION 3/6/14**
### 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

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| Articulation of DCIs across grade-bands: | MS.ETS1.A (3-5-ETS1-1), K-ETS1.A (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3); 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) |
| 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-ETS-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-ETS-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 | 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) |
| 3-5.OA | Operations and Algebraic Thinking (3-5-ETS1-1), (3-5-ETS1-2) |
4-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

Chapter 4 Performance Expectation Activity, 229a

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

Chapter 4 Performance Expectation Activity, 229b

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engaging in Argument from Evidence</strong></td>
<td><strong>LS1.A: Structure and Function</strong></td>
<td><strong>Systems and System Models</strong></td>
</tr>
<tr>
<td>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).</td>
<td>Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)</td>
<td>A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-2)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 136, Explore It!; 142, Explore It!; 228, Write a Biography</td>
<td><strong>SE/TE:</strong> 114, Try It!; 122-123, Classifying Plants; 124-127, Classifying Animals; 128-135, Lesson 2; 136-141, Lesson 3; 142-147, Lesson 4; 170, Chapter Review – Lessons 1-4; 172, Benchmark Practice – Questions 4, 5, 6</td>
<td><strong>TE Only:</strong> 116-119, STEM Activity; 128-135, Lesson 2; 136-141, Lesson 3; 154, My Planet Diary; 178-181, STEM Activity; 228, Write a Biography</td>
</tr>
<tr>
<td><strong>TE Only:</strong> xlvii-xlvi, Quest; 113, SEP: Engaging in Argument from Evidence; 125, Differentiated Instruction; 133, Differentiated Instruction; 141a, Explore It!; 144, Differentiated Instruction – Advanced; 146, Science Notebook; 147a, Explore It!; 151, Differentiated Instruction; 229a, Performance Expectation Activity; 229a, ELA/Literacy</td>
<td><strong>TE Only:</strong> xlvii-xlvi, Quest; 112C, What Do Leaves and Stems Do?; 112G-112H, Leveled Content Reader Support; 126, Professional Development Note; 127b, Lesson 1 Check – Questions 1-5; 135a, My Planet Diary; 134, 21st Century Learning; 135b, Lesson 2 Check – Questions 1-6; 141a, Explore It!; 141b, Lesson 3 Check – Questions 1-6; 147a, Explore It!; 147b, Lesson 4 Check – Questions 1-6; 171a, Chapter 4 Test – Questions 2, 3; 171b, Chapter 4 Test – Question 9; 229a, Performance Expectation Activity</td>
<td><strong>TE Only:</strong> xlvii-xlvi, QUEST; 112, CCC: Systems and System Models; 154, Professional Development Note; 159a, My Planet Diary</td>
</tr>
</tbody>
</table>

- Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2)

| **SE/TE:** 142, Explore It | **LS1.D: Information Processing** | **Systems and System Models** |
| **TE Only:** xlvii-xlvi, QUEST; 111g, Performance Expectation Activity; 147a, Explore It!; 229b, Performance Expectation Activity | Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2) | A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-2) |

| **SE/TE:** 128, My Planet Diary; 132, Pollen on the Move; 154-159, Lesson 6; 171, Chapter Review – Lesson 6 | **TE Only:** 135a, My Planet Diary; 159a, My Planet Diary; 159b, Lesson 6 Check – Questions 1-6; 171a, Chapter 4 Test – Questions 3, 6; 229b, Performance Expectation Activity | **TE Only:** xlvii-xlvi, QUEST; 112, CCC: Systems and System Models; 154, Professional Development Note; 159a, My Planet Diary |
Connections to other DCIs in fourth grade: N/A

Articulation of DCIs across grade-bands: 1.LS1.A (4-LS1-1); 1.LS1.D (4-LS1-2); 3.LS3.B (4-LS1-1); MS.LS1.A (4-LS1-1),(4-LS1-2); MS.LS1.D (4-LS1-2)

Common Core State Standards Connections:

ELA/Literacy –
W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)

Mathematics –
4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

NOTE:
Grade 4, includes:
From Molecules to Organisms: Structures and Processes, Earth’s Place in the Universe, Earth’s Systems, Earth and Human Activity, Energy, Waves and their Applications in Technologies for Information Transfer, and Engineering Design.
**4-ESS1 Earth’s Place in the Universe**

Students who demonstrate understanding can:

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could include rock layers with shell fossils above rock layers with plant fossils and no shells, indicating a change from water to land over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]

Chapter 6 Performance Expectation Activity, 295d

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructing Explanations and Designing Solutions</td>
<td>4-ESS1.C: The History of Planet Earth</td>
<td>Patterns</td>
</tr>
<tr>
<td>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. * Identify the evidence that supports particular points in an explanation. (4-ESS1-1)*</td>
<td>• Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)</td>
<td>• Patterns can be used as evidence to support an explanation. (4-ESS1-1)</td>
</tr>
<tr>
<td>SE/TE: 244, Explore It!; 247, Classify; 249, Identify; 293, Interpret Your Data; 321, Explanations; 326, Evidence and Inferences</td>
<td>SE/TE: 210, Fossil Age; 244-251, Lesson 2; 260, My Planet Diary; 261, Earth’s Moving Plates; 262, Volcanoes; 263, Earthquakes; 286, Lesson 2; 295, Create a Booklet</td>
<td>SE/TE: 244, Explore It!; 246-247, Igneous Rocks; 248-249, Sedimentary Rock; 252-253, The Rock Cycle; 254, Explore It!; 259, Deposition; 277, Water Cycle and Climate</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 203, 21st Century Learning; 204, Differentiated Instruction; 229c, Performance Expectation Activity; 229c, 248, Differentiated Instruction; 251, Differentiated Instruction – Advanced; 253a, Explore It!; ELA/Literacy; 295d, Performance Expectation Activity</td>
<td><strong>TE Only:</strong> 211b, Lesson 5 Check – Question 4; 221b, Chapter 5 Test – Question 8; 229c, Performance Expectation Activity; 229c, ELA/Literacy; 230C, Uncovering Fossils; 230G-230H, Leveled Content Reader Support; 249, Professional Development Note; 253a, Explore It!; 253b, Lesson 2 Check – Questions 1-6; 287b, Chapter 6 Test – Questions 7, 8; 295d, Performance Expectation Activity; 295d, ELA/Literacy</td>
<td><strong>TE Only:</strong> 229c, Performance Expectation Activity; 295d, Performance Expectation Activity; 295d, ELA/Literacy</td>
</tr>
</tbody>
</table>

**Connections to Nature of Science**

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

• Science assumes consistent patterns in natural systems. (4-ESS1-1)

SE/TE: 202-203, How Fossils Form; 248-249, Sedimentary Rock; 252-253, The Rock Cycle; 258, Erosion; 260, My Planet Diary; 261, Earth’s Moving Plates

**TE Only:** 229c, Performance Expectation Activity; 249, Professional Development Note; 252, Science Notebook; 265a, My Planet Diary; 277a, Explore It!; 277b, Lesson 6 Check – Questions 1-6; 295d, Performance Expectation Activity
Connections to other DCIs in fourth grade: N/A

Articulation of DCIs across grade-bands: 2.ESS1.C (4-ESS1-1); 3.LS4.A (4-ESS1-1); MS.LS4.A (4-ESS1-1); MS.ESS1.C (4-ESS1-1); MS.ESS2.A (4-ESS1-1); MS.ESS2.B (4-ESS1-1)

Common Core State Standards Connections:

ELA/Literacy –

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS1-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS1-1)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS1-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. (4-ESS1-1)

MP.4 Model with mathematics. (4-ESS1-1)

4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36). (4-ESS1-1)
### 4-ESS2  Earth’s Systems

Students who demonstrate understanding can:

**4-ESS2-1.** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

Chapter 6 Performance Expectation Activity, 295a

**4-ESS2-2.** Analyze and interpret data from maps to describe patterns of Earth’s land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.

Chapter 6 Performance Expectation Activity, 295b

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning and Carrying Out Investigations</td>
<td>ESS2.A: Earth Materials and Systems</td>
<td>Patterns</td>
</tr>
<tr>
<td>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.</td>
<td>- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)</td>
<td>- Patterns can be used as evidence to support an explanation. (4-ESS2-2)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 234-237, STEM Activity; 278-279, Investigate It!; 290-293, Apply It!; 319, Observation and Evidence</td>
<td><strong>ESS2.B: Plate Tectonics and Large-Scale System Interactions</strong></td>
<td><strong>SE/TE:</strong> 244, Explore It!; 246-247, Igneous Rocks; 248-249, Sedimentary Rock; 252-253, The Rock Cycle; 254, Explore It!; 259, Deposition; 277, Water Cycle and Climate</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 229c, Performance Expectation Activity; 231, SEP: Planning and Carrying Out Investigations; 257, Science Notebook; 279a-179d, Activity Card Support; 295a, Performance Expectation Activity</td>
<td>- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)</td>
<td><strong>TE Only:</strong> 229c, Performance Expectation Activity; 295d, Performance Expectation Activity; 295d, ELA/Literacy</td>
</tr>
<tr>
<td>Analyzing and Interpreting Data</td>
<td>- <strong>Cause and Effect</strong></td>
<td><strong>SE/TE:</strong> 244-245, Envision It!; 254-255, Envision It!; 256-257, Weathering; 258, Erosion; 260-265, Lesson 4; 276, Water Cycle and Weather; 278-279, Investigate It!; 290-293, Apply It!</td>
</tr>
<tr>
<td>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.</td>
<td>- Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)</td>
<td><strong>TE Only:</strong> 230, CCC: Cause and Effect; 258, Science Notebook; 265b, Lesson 4 Check – Question 6; 279a-279d, Activity Card Support; 295a, Performance Expectation Activity</td>
</tr>
</tbody>
</table>
sense of phenomena using logical reasoning. (4-ESS2-2)

**SE/TE:** 234-237, STEM Activity; 278-279, Investigate It!
**TE Only:** 279a-279d, Activity Card Support; 295b, Performance Expectation Activity;

- **SE/TE:** 255, Earth’s Surface; 260, My Planet Diary; 261, Earth’s Moving Plates; 262, Volcanoes; 263, Earthquakes; 268-269, Surface Water; 280, The Galápagos Islands; 287, Chapter Review – Lesson 4; 295, Create a Booklet; 295, Make a Map
- **TE Only:** 262, 21st Century Learning; 265a, My Planet Diary; 265b, Lesson 4 Check – Questions 1, 4, 5; 248, Science – Social Studies; 263, Science – Social Studies; 269, Science – Social Studies; 287b, Chapter 6 Test – Question 8; 295b, Performance Expectation Activity; 295b, ELA/Literacy

**ESS2.E: Biogeology**
- Living things affect the physical characteristics of their regions. (4-ESS2-1)

**SE/TE:** 188-193, Lesson 2; 214, Rachel Carson; 220, Chapter Review – Lesson 2; 229, Make a Presentation; 256-257, Weathering
**TE Only:** 193b, Lesson 2 Check – Questions 5, 6; 215, 21st Century Learning; 221b, Chapter 5 Test – Question 9

**Connections to other DCIs in fourth grade:** N/A

**Articulation of DCIs across grade-bands:** 2.ESS1.C (4-ESS2-1); 2.ESS2.A (4-ESS2-1); 2.ESS2.B (4-ESS2-2); 2.ESS2.C (4-ESS2-2); 5.ESS2.A (4-ESS2-1); 5.ESS2.C (4-ESS2-2); MS.ESS1.C (4-ESS2-2); MS.ESS2.A (4-ESS2-2); MS.ESS2.B (4-ESS2-2)

**Common Core State Standards Connections:**

**ELA/Literacy –**

**RL.4.7** Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)

**W.4.7** Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS2-1)

**W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS2-1)

**Mathematics –**

**MP.2** Reason abstractly and quantitatively. (4-ESS2-1)

**MP.4** Model with mathematics. (4-ESS2-1)

**MP.5** Use appropriate tools strategically. (4-ESS2-1)

**4.MD.A.1** Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, *know that 1 ft is 12 times as long as 1 in.* Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36). . . . (4-ESS2-1)

**4.MD.A.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-1),(4-ESS2-2)
### 4-ESS3 Earth and Human Activity

**Students who demonstrate understanding can:**

**4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.** [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]

Chapter 5 Performance Expectation Activity, 229d

**4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.**

[Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

Chapter 6 Performance Expectation Activity, 295c

<table>
<thead>
<tr>
<th><strong>Science and Engineering Practices</strong></th>
<th><strong>Disciplinary Core Ideas</strong></th>
<th><strong>Crosscutting Concepts</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obtaining, Evaluating, and Communicating Information</strong></td>
<td><strong>ESS3.A: Natural Resources</strong></td>
<td><strong>Connections to Engineering, Technology, and Applications of Science</strong></td>
</tr>
<tr>
<td>Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.</td>
<td>• Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)</td>
<td><strong>Interdependence of Science, Engineering, and Technology</strong></td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 45, Field Trip; 300-303, Do Research; 357, Design Process; 358, Step 2: Do Research</td>
<td><strong>SE/TE:</strong> 13, Go Green; 45, Field Trip; 194-199, Lesson 3; 211, Fossil Fuels; 220, Chapter Review – Lesson 3; 222, Benchmark Practice</td>
<td>• Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1)</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 13, 21st Century Learning; 27, 21st Century Learning; 32, 21st Century Learning; 93, Science – Social Studies; 111b, ELA/Literacy; 111c, Performance Expectation Activity; 111d, Performance Expectation Activity; 111d, ELA/Literacy; 196, 21st Century Learning; 229d, Performance Expectation Activity; 229d, ELA/Literacy</td>
<td><strong>SE/TE:</strong> 260-265, Lesson 4; 295, Create a Booklet</td>
<td><strong>SE/TE:</strong> 45, Field Trip; 350-355, Lesson 1</td>
</tr>
<tr>
<td><strong>Conducting Explanations and Designing Solutions</strong></td>
<td><strong>ESS3.B: Natural Hazards</strong></td>
<td><strong>Influence of Science, Engineering and Technology on Society and the Natural World</strong></td>
</tr>
<tr>
<td>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.</td>
<td>• A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.W.C.)</td>
<td>• Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 234-237, STEM Activity; 357-363, Design Process</td>
<td><strong>SE/TE:</strong> 265a, My Planet Diary; 265b, Lesson 4 Check – Questions 2, 3, 6; 295c, Performance Expectation Activity; 295c, ELA/Literacy</td>
<td><strong>TE Only:</strong> 296, CCC: Influence of Engineering, Technology, and Science on Society and the Natural World: 342G-342H, Leveled Content Reader Support; 355a, My Planet Diary; 355b, Lesson 1 Check – Questions 1-6</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 295c, Performance Expectation Activity; 295c, ELA/Literacy</td>
<td><strong>ETS1.B: Designing Solutions to Engineering Problems</strong></td>
<td>• Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)</td>
</tr>
<tr>
<td></td>
<td>• Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)</td>
<td><strong>SE/TE:</strong> 234-237, STEM Activity; 289, STEM: Robotic Fish; 295, Create a Booklet</td>
</tr>
</tbody>
</table>
## Connections to other DCIs in fourth grade:

- **4.ETS1.C** (4-ESS3-2)

## Articulation of DCIs across grade-bands:

- **K.ETS1.A** (4-ESS3-2)
- **2.ETS1.B** (4-ESS3-2)
- **2.ETS1.C** (4-ESS3-2)
- **5.ESS3.C** (4-ESS3-1)
- **MS.PS3.D** (4-ESS3-1)
- **MS.ESS2.A** (4-ESS3-1, 4-ESS3-2)
- **MS.ESS3.A** (4-ESS3-1)
- **MS.ESS3.B** (4-ESS3-2)
- **MS.ESS3.C** (4-ESS3-1)
- **MS.ESS3.D** (4-ESS3-1)
- **MS.ETS1.B** (4-ESS3-2)

## Common Core State Standards Connections:

### ELA/Literacy –

- **RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)
- **RI.4.9** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)
- **W.4.7** Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS3-1)
- **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1)
- **W.4.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS3-1)

### Mathematics –

- **MP.2** Reason abstractly and quantitatively. (4-ESS3-1, 4-ESS3-2)
- **MP.4** Model with mathematics. (4-ESS3-1, 4-ESS3-2)
- **4.OA.A.1** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1, 4-ESS3-2)
### 4-PS3 Energy

Students who demonstrate understanding can:

**4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.** [Clarification Statement: Examples of evidence relating speed and energy could include change of shape on impact or other results of collisions.] [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

Chapters 1 and 2 Performance Expectation Activity, 111a

**4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, and electric currents.** [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

Chapters 1 and 3 Performance Expectation Activity, 111b

**4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.** [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

Chapters 1 and 2 Performance Expectation Activity, 111c

**4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.** [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

Chapters 1, 3, 4 Performance Expectation Activity, 111d

<table>
<thead>
<tr>
<th>Asking Questions and Defining Problems</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
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<tr>
<td>Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.</td>
<td>PS3.A: Definitions of Energy</td>
<td>Energy and Matter</td>
</tr>
<tr>
<td>- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)</td>
<td>• The faster a given object is moving, the more energy it possesses. (4-PS3-1)</td>
<td>• Energy can be transferred in various ways and between objects. (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4)</td>
</tr>
<tr>
<td>SE/TE: 59, Lightning Lab; 110, Height and Potential Energy; 316-317, A Bouncing-Ball Experiment; 328, Go Further</td>
<td>SE/TE: 10-11, Forms of Energy; 30, A Conduction Example; 31, Convection/Radiation; 62, Explore It! 63, Speed; 64, At-Home Lab; 75, Chapter Review, Lesson 2; Benchmark Practice-Question 3; 77, Go Green!, TE Only: 1G-1H, Leveled Content Reader Support; 8, Professional Development Note; 30, Professional Development Note; 67a, Explore It! 111a, Performance Expectation Activity; 111a, ELA/Literacy</td>
<td>SE/TE: 16, My Planet Diary; 17, Sound Energy; 18, How Sounds Travels; 24, Light Waves We See; 27, Absorption; 28-34, Lesson 4; 34-35, Investigate It!; 36, Science in Your Backyard; 42-43, Chapter Review – Lessons 2 and 4; 44, Benchmark Practice – Question 5; 59, Lightning Lab; 80, Try It!; 81, Let’s Read Science; 82-85, STEM Activity; 86-91, Lesson 1; 92-95, Lesson 2; 103, Chapter Review, Lesson 2; 104, Benchmark Practice – Question 5; 111, Design a Device</td>
</tr>
<tr>
<td>SE/TE Only: 47, SEP: Asking Questions and Defining Problems; 111c, Performance Expectation Activity; 328, 21st Century Learning</td>
<td>SE/TE: 14-15, Energy and Motion/Forms of Potential Energy; 16, My Planet Diary; 17, Sound Energy; 18, How Sounds Travels; 24, Light Waves We See; 26-27, Light and Matter; 36, Science in Your Backyard; 80, Try It!; 88, How Electric Charges Flow; 90-91, Circuits; 92-95, Lesson 2; 102, Chapter Review – Lesson 1; 103, Chapter Review – Lesson 2; 104, Benchmark Practice – Question 3</td>
<td>TE Only: 1j, CCC: Energy and Matter; 33a, Explore It!; 33b, Lesson 1 Check – Questions 1-6; 35a-35d, Activity Card Support; 43a-43b, Chapter 1 Test – Questions 7-10; 46, CCC: Energy and Matter; 78, CCC: Energy and Matter; 95a, Explore It!; 95b, Lesson 2 Check – Questions 1-6; 97b, Investigate It!; 103a, Chapter 3 Test – Questions 1, 3, 5; 103b, Chapter 3 Test – Questions 9, 10; 111b, Performance Expectation Activity; 111b, ELA/Literacy; 111d, Performance Expectation Activity</td>
</tr>
<tr>
<td>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.</td>
<td>• Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2), (4-PS3-3)</td>
<td>• Energy can be transferred in various ways and between objects. (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4)</td>
</tr>
<tr>
<td>Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2)</td>
<td>SE/TE: 2, Try It!; 28, Explore It!; 34-35, Investigate It!; 68-69, Investigate It!; 80, Try It!; 106-109, Apply It!; 110, Height and Potential Energy; 194, Explore It!</td>
<td>SE/TE: 16, My Planet Diary; 17, Sound Energy; 18, How Sounds Travels; 24, Light Waves We See; 27, Absorption; 28-34, Lesson 4; 34-35, Investigate It!; 36, Science in Your Backyard; 42-43, Chapter Review – Lessons 2 and 4; 44, Benchmark Practice – Question 5; 59, Lightning Lab; 80, Try It!; 81, Let’s Read Science; 82-85, STEM Activity; 86-91, Lesson 1; 92-95, Lesson 2; 103, Chapter Review, Lesson 2; 104, Benchmark Practice – Question 5; 111, Design a Device</td>
</tr>
<tr>
<td>SE/TE Only: 1, SEP: Planning and Carrying Out Investigations; 33a, Explore It!; 67a, Explore It!; 78C, Electrical Charges and Interactions; 111a, Performance Expectation Activity; 111c, Performance</td>
<td>TE Only: 1G-1H, Leveled Content Reader Support; 91b, Lesson 1 Check – Questions 1, 6; 95a, Explore It!; 95b, Lesson 2 Check – Questions 1-6; 103a, Chapter 3 Test – Questions 3, 4; 103b, Chapter 3 Test – Questions 9, 10; 111b, Performance Expectation Activity; 111b, ELA/Literacy;</td>
<td>TE Only: 1j, CCC: Energy and Matter; 33a, Explore It!; 33b, Lesson 1 Check – Questions 1-6; 35a-35d, Activity Card Support; 43a-43b, Chapter 1 Test – Questions 7-10; 46, CCC: Energy and Matter; 78, CCC: Energy and Matter; 95a, Explore It!; 95b, Lesson 2 Check – Questions 1-6; 97b, Investigate It!; 103a, Chapter 3 Test – Questions 1, 3, 5; 103b, Chapter 3 Test – Questions 9, 10; 111b, Performance Expectation Activity; 111b, ELA/Literacy; 111d, Performance Expectation Activity</td>
</tr>
</tbody>
</table>
### 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., measurements, observations, patterns) to construct an explanation. (4-PS3-1)

**SE/TE:** 36, Science in Your Backyard; 48, Try It!; 62, Explore It!; 64, At-Home Lab; 68-69, Investigate It

**TE Only:** 46D, The Force of Seatbelts and Airbags; 67a, Explore It!; 79, SEP: Construction Explanations and Designing Solutions; 111a, Performance Expectation Activity

- Apply scientific ideas to solve design problems. (4-PS3-4)

**SE/TE:** 4-7, STEM Activity; 50-53, STEM Activity; 96-97, Investigate It!; 344, Try It!

**TE Only:** 35b, Investigate It!; 97a-97d, Activity Card Support; 79, SEP: Construction Explanations and Designing Solutions; 111d, Performance Expectation Activity

### PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2)

**SE/TE:** 2, Try It!; 9, Energy; 10-11, Forms of Energy; 12-13, Where is the Energy?; 14, Energy and Motion; 17, Sound Energy, 24, Light Waves We See; 29, Conduction; 30, At-Home Lab; 31, Convection/Radiation; 44, Benchmark Practice – Question 1; 58, Forces Affect Objects; 59, Force and Motion; 59, Lightning Lab; 82-85, STEM Activity; 110, Height and Potential Energy

**TE Only:** 1C-1D, Teacher Background; 1G-1H, Leveled Content Reader Support; 15b, Lesson 1 Check – Question 5; 43a, Chapter 1 Test – Question 1; 43b, Chapter 1 Test – Question 7; 111b, Performance Explanation Activity; 111b, ELA/Literacy; 111c, Performance Explanation Activity; 111c, ELA/Literacy

- Light also transfers energy from place to place. (4-PS3-2)

**SE/TE:** 11, Light Energy; 22-27, Lesson 3; 93, Energy Changing Form; 94, Light from Electricity; 103, Chapter Review – Do the Math

**TE Only:** 1C, Teacher Background; 1G-1H, Leveled Content Reader Support; 27b, Lesson 3 Check – Question 5; 95b, Lesson 2 Check – Question 1; 111b, Performance Explanation Activity; 111b, Mathematics

- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2)

**SE/TE:** 10, Electrical Energy; 88-89, How Electric Charges Flow; 90-91, Circuits; 92-95, Lesson 2; 98, Science Careers; 102, Chapter Review – Lesson 1; 103, Chapter Review – Lesson 2; 104, Benchmark Practice – Question 5

**TE Only:** 1G-1H, Leveled Content Reader Support; 78D, Transformer Basics; 91b, Lesson 1 Check – Questions 2, 4, 6; 95a, Explore It!; 95b, Lesson 2 Check – Questions 1-6; 103b, Chapter 3 Test –
### Question 10; 111b, Performance Expectation Activity; 111b, ELA/Literacy; 111e, Performance Expectation Activity

**PS3.C: Relationship Between Energy and Forces**
- When objects collide, the contact forces transfer energy so as to change the objects’ motions. (4-P3-3)

**SE/TE:** 17, Sound Energy; 58, Forces Affect Objects; 59, Force and Motion; 59, Lightning Lab; 110, Height and Potential Energy

**TE Only:** 111c, Performance Expectation Activity; 111c, ELA/Literacy

**PS3.D: Energy in Chemical Processes and Everyday Life**
- The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use. (4-P3-4)

**SE/TE:** 9, Energy; 10-11, Forms of Energy; 14-15, Forms of Potential Energy; 42, Chapter Review – Lesson 1

**TE Only:** 15b, Lesson 1 Ck – Questions 1-4, 6

ETS1.A: Defining Engineering Problems
- 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. (secondary to 4-P3-4)

**SE/TE:** 4-7, STEM Activity; 32, Changes of Other Energy to Heat; 50-53, STEM Activity; 96-97, Investigate It!; 111, Design a Device; 344, Try It!; 356-363, Design Process

**TE only:** 97a-97d, Activity Card Support

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### Connections to other DCIs in fourth grade:

N/A

### Articulation of DCIs across grade-bands:


### Common Core State Standards Connections:

- **RL.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-P3-1)
- **RL.4.3** Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-P3-1)
- **RL.4.9** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-P3-1)
- **W.4.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-P3-1)
- **W.4.7** Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-P3-2), (4-P3-3), (4-P3-4)
- **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-P3-1), (4-P3-2), (4-P3-3), (4-P3-4)
- **W.4.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-P3-1)
- **Mathematics – 4.OA.A.3** Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-P3-4)
# 4-PS4 Waves and their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

### 4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
- **Clarification Statement:** Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.  
- **Assessment Boundary:** Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.

Chapter 1 Performance Expectation Activity, 111e

### 4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- **Clarification Statement:** Examples of solutions could include drums sending coded information through sound waves, using a grid of 1’s and 0’s representing black and white to send information about a picture, and using Morse code to send text.

Chapter 1 Performance Expectation Activity, 111g

### 4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.
- **Clarification Statement:** Examples of solutions could include drums sending coded information through sound waves, using a grid of 1’s and 0’s representing black and white to send information about a picture, and using Morse code to send text.

Chapter 1 Performance Expectation Activity, 111f

## Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts
--- | --- | ---
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.  
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle.  

**SE/TE:** 20, Lightning Lab; 320, Models  
**TE Only:** 111e, Performance Expectation Activity
- Develop a model to describe phenomena.  

**SE/TE:** 22, Explore It!; 22a111, Design a Device;  
**TE Only:** 111g, Performance Expectation Activity; 111g, ELA/Literacy

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 solution.

**SE/TE:** 359, Step3: Develop Possible Solutions; 362, Step7: Communicate Results  
**TE Only:** 111f, Performance Expectation Activity

**PS4.A: Wave Properties**  
- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; it does not move in the direction of the wave except when the water meets the beach.  

**SE/TE:** 18, How Sound Travels; 19, Frequency and Wavelength; 269, Ocean and Seas  
**TE Only:** 1G-1H, Leveled Content Reader Support; 18, Professional Development Note
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).

**SE/TE:** 18, How Sound Travels; 19, Frequency and Wavelength; 20-21, Frequency/Volume; 36, Science in Your Backyard  
**TE Only:** 19, Common Misconception; 19, Science Notebook; 21b, Lesson 2 Check – Questions 1, 4; 111e, Performance Expectation Activity

**PS4.B: Electromagnetic Radiation**  
- An object can be seen when light reflected from its surface enters the eyes.

**SE/TE:** 22, Explore It!; 26-27, Light and Matter; 43, Chapter Review – Lesson 3; 308, Explore It!  
**TE Only:** 1G-1H, Leveled Content Reader Support

**Patterns**  
- Similarities and differences in patterns can be used to sort and classify natural phenomena.  

**SE/TE:** 16-21, Lesson 1; 20, Lightning Lab  
**TE Only:** 1C, The Speed of Sound; 1G, Leveled Content Reader Support; 111e, Performance Expectation Activity; 111f, Performance Expectation Activity

**Cause and Effect**  
- Cause and effect relationships are routinely identified.

**SE/TE:** 2, Try It!  
**TE Only:** 27, Infer; 26, Determine; 78, CCC: Energy and Matter; 111g, Performance Expectation Activity
### Connections to Nature of Science

**Scientific Knowledge is Based on Empirical Evidence**
- Science findings are based on recognizing patterns. (4-PS4-1)

**SE/TE:** 18, How Sound Travels; 19, Frequency and Wavelength; 319, Observations and Evidence

**TE Only:** 111e, Performance Expectation Activity; 111f, Performance Expectation Activity

### PS4.C: Information Technologies and Instrumentation

- Digitized information transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3)

**SE/TE:** 10-11, Forms of Energy; 93, Energy Changing Form; 96-97, Investigate It!: 350-351, Envision It!: 351, Scientific Discoveries; 353, Today’s transportation systems...; 354-355, Everyday Technologies

**TE Only:** 1G-1H Leveled Content Reader Support; 97a-97d, Activity Card Support; 296G-296H, Leveled Content Reader Support; 342G-342H, Leveled Content Reader Support; 355b, Lesson 1 Check – Question 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. (secondary to 4-PS4-3)

**SE/TE:** 356-363, Lesson 2

**TE Only:** 111f, Performance Expectation Activity; 343, SEP: Constructing Explanations and Designing Solutions

### Connections to Other DCIs in Fourth Grade:

- 4.PS3.A (4-PS4-1); 4.PS3.B (4-PS4-1); 4.ETS1.A (4-PS4-3)

### Articulation of DCIs across grade-bands:

- K.ETS1.A (4-PS4-3); 1.PS4.B (4-PS4-2); 1.PS4.C (4-PS4-3); 2.ETS1.B (4-PS4-3); 2.ETS1.C (4-PS4-3); 3.PS2.A (4-PS4-3); MS.PS4.A (4-PS4-1); MS.PS4.B (4-PS4-2); MS.PS4.C (4-PS4-3); MS.LS1.D (4-PS4-2); MS.ETS1.B (4-PS4-3)

### Common Core State Standards Connections:

**ELA/Literacy**
- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS4-3)
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-1),(4-PS4-2)

**Mathematics**
- MP.4 Model with mathematics. (4-PS4-1),(4-PS4-2)
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-1),(4-PS4-2)
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.

- Is It Cold In Here? STEM Activity, 4-7
- How Can You Keep Liquids Warm or Cold? STEM Activity, 82-85
- Chapters 1 and 3 Performance Expectation Activity, 111d
- Natural Humidifier STEM Activity, 116-119
- Time to Clean Green! STEM Activity, 300-303
- What’s Inside? STEM Activity, 346-349
- Performance-Based Assessment: Design a Package, 380

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.

- What’s Inside? STEM Activity, 346-349
- Design It! What design will carry cargo best?, 374

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.

- Let’s Glide Away! STEM Activity, 50-53
- How Can You Keep Liquids Warm or Cold? STEM Activity, 82-85
- Hold Back the Water STEM Activity, 234-237
- Chapter 6 Performance Expectation Activity, 295c
- Try It! How can you design a hovercraft? 344
- Investigate It! Which boat design will hold more cargo?, 364

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

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<th>Science and Engineering Practices</th>
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<th>Crosscutting Concepts</th>
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<tr>
<td><strong>Asking Questions and Defining Problems</strong></td>
<td>3-5-ETS1-A: Defining and Delimiting Engineering Problems</td>
<td>Influence of Engineering, Technology, and Science on Society and the Natural World</td>
</tr>
<tr>
<td>Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.</td>
<td>- 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 meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)</td>
<td>- People’s needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)</td>
</tr>
<tr>
<td>SE/TE: 4, Identify the Problem; 50, Identify the Problem; 82, Identify the Problem; 116, Identify the Problem; 178, Identify the Problem; 234, Identify the Problem; 300, Identify the Problem; 346, Identify the Problem; 374, Identify the Problem;</td>
<td><strong>SE/TE:</strong> 4, STEM Activity; 50, STEM Activity; 82-85, STEM Activity; 116-119, STEM Activity; 178-181, STEM Activity; 234-237, STEM Activity; 300-303, STEM Activity; 346-349, STEM Activity; 357-363, Design Process; 374-379, Design It!</td>
<td>SE/TE: 45, Solar Cooking; 350-355, Lesson 1</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 297, SEP: Asking Questions and Defining Problems</td>
<td><strong>SE/TE:</strong> 4-7, STEM Activity; 50-53, STEM Activity</td>
<td><strong>TE Only:</strong> 296, CCC: Influence of Engineering, Technology, and Science on Society and the Natural World; 342G-342H, Leveled Content Reader Support; 355a, My Planet Diary; 355b, Lesson 1 Check – Questions 1-6</td>
</tr>
<tr>
<td><strong>Planning and Carrying Out Investigations</strong></td>
<td>3-5-ETS1-B: Developing Possible Solutions</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>- 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)</td>
<td>- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)</td>
</tr>
<tr>
<td>SE/TE: 4-7, STEM Activity; 50-53, STEM Activity</td>
<td><strong>SE/TE:</strong> 4, Do Research; 50-52, Do Research; 82-83, Do Research; 116-117, Do Research; 178-179, Do Research; 234-235, Do Research; 300-301, Do Research; 357, Design Process; 358, Step 2: Do Research; 375, Do Research</td>
<td><strong>SE/TE:</strong> 70, Smart Plane; 234-237, STEM Activity; 289, Robotic Fish; 295, Make a Booklet; 350-351, Envision It!; 350-355, Lesson 1; 357-363, Design Process; 366,</td>
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</table>
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)

SE/TE: 4-7, STEM Activity; 50-53, STEM Activity; 82-85, STEM Activity; 116-119, STEM Activity; 178-181, STEM Activity; 234-237, STEM Activity; 300-303, STEM Activity; 346-349, STEM Activity; 357-363, Design Process; 374-379, Design It!

TE Only: 343, SEP: Constructing Explanations and Designing Solutions

- 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)

SE/TE: 6, Test the Prototype; 84, Test the Prototype; 119, Test the Prototype; 180-181, Test the Prototype; 236, Test the Prototype; 303, Test the Prototype; 349, Test the Prototype; 361, Step 6: Test the Prototype; 378, Test the Prototype

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)

SE/TE: 7, Evaluate and Redesign; 85, Evaluate and Redesign; 119, Evaluate and Redesign; 181, Evaluate and Redesign; 237, Evaluate and Redesign; 303, Evaluate and Redesign; 349, Evaluate and Redesign; 363, Step 8: Evaluate and Redesign; 379, Evaluate and Redesign

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

<table>
<thead>
<tr>
<th>Connection</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submersibles</td>
<td>370, Chapter Review – Lesson 1; 371, Chapter Review – Lesson 2; 372, Benchmark Practice – Questions 2, 3, 5</td>
</tr>
<tr>
<td>TE Only</td>
<td>260, Professional Development Note; 342G-342H, Leveled Content Reader Support; 342, CCC: Influence of Engineering, Technology, and Science on Society and the Natural World; 355a, My Planet Diary; 355b, Lesson 1 Check – Questions 1-6; 363b, Lesson 2 Check – Questions 1-6; 371a, Part 2 Test – Questions 1-6; 371b, Part 2 Test – Questions 7, 9</td>
</tr>
<tr>
<td>Activity; 82-85, STEM Activity; 116-119, STEM Activity; 178-181, STEM Activity; 234-237, STEM Activity; 300-303, STEM Activity; 346-349, STEM Activity; 357-363, Design Process; 374-379, Design It!</td>
<td>450x710</td>
</tr>
<tr>
<td>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)</td>
<td>450x710</td>
</tr>
<tr>
<td>SE/TE: 363, Communicate Results</td>
<td>450x710</td>
</tr>
<tr>
<td>TE Only: 5, Pre-Activity Discussion; 6, Post-Activity Discussion; 51, Pre-Activity Discussion; 52, Post-Activity Discussion; 83, Pre-Activity Discussion; 84, Post-Activity Discussion; 117, Pre-Activity Discussion; 118, Post-Activity Discussion; 179, Pre-Activity Discussion; 180, Post-Activity Discussion; 235, Pre-Activity Discussion; 236, Post-Activity Discussion; 301, Pre-Activity Discussion; 302, Post-Activity Discussion; 347, Pre-Activity Discussion; 348, Post-Activity Discussion</td>
<td>450x710</td>
</tr>
<tr>
<td>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)</td>
<td>450x710</td>
</tr>
<tr>
<td>SE/TE: 6, Test the Prototype; 84, Test the Prototype; 119, Test the Prototype; 180-181, Test the Prototype; 236, Test the Prototype; 303, Test the Prototype; 349, Test the Prototype; 361, Step 6: Test the Prototype; 378, Test the Prototype</td>
<td>450x710</td>
</tr>
<tr>
<td>ETS1.C: Optimizing the Design Solution</td>
<td>450x710</td>
</tr>
<tr>
<td>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)</td>
<td>450x710</td>
</tr>
<tr>
<td>SE/TE: 7, Evaluate and Redesign; 85, Evaluate and Redesign; 119, Evaluate and Redesign; 181, Evaluate and Redesign; 237, Evaluate and Redesign; 303, Evaluate and Redesign; 349, Evaluate and Redesign; 363, Step 8: Evaluate and Redesign; 379, Evaluate and Redesign</td>
<td>450x710</td>
</tr>
</tbody>
</table>

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OFFICE OF LEARNING
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)
- **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)

**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** 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)
- **3-5.OA** Operations and Algebraic Thinking (3-5-ETS1-1), (3-5-ETS1-2)
## 5-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

**5-LS1-1.** Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

Chapters 3 and 4 Performance Expectation Activity, 195b

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

**Science and Engineering Practices**
- 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).
  - Support an argument with evidence, data, or a model. (5-LS1-1)

**Disciplinary Core Ideas**
  - Plants acquire their material for growth chiefly from air and water. (5-LS1-1)
  - SE/TE: 112-113, Structures for Respiration and Circulation; 114, Explore It!; 132-133, Investigate It!; 146-149, STEM Activity; 150-157, Lesson 1
  - TE Only: 119a, Explore It!; 155, Science Notebook; 133a-133d, Activity Card Support; 157, Differentiated Instruction; 195b, Performance Expectation Activity; 195b, ELA/Literacy

**Crosscutting Concepts**
- Energy and Matter
  - Matter is transported into, out of, and within systems. (5-LS1-1)
  - SE/TE: 111, At-Home Lab; 144, Try It!; 158-165, Lesson 2; 187, Chapter Review - Question 11, 189. Go Green!
  - TE Only: 100, CCC: Energy and Matter; 195a, Performance Expectation Activity; 195c Performance Expectation Activity

**Connections to other DCIs in fifth grade:** 5.PS1.A (5-LS1-1)

**Articulation of DCIs across grade-bands:** K.LS1.C (5-LS1-1); 2.LS2.A (5-LS1-1); MS.LS1.C (5-LS1-1)

**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. (5-LS1-1)
- **RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1)
- **W.5.1** Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)

**Mathematics**
- **MP.2** Reason abstractly and quantitatively. (5-LS2-1)
- **MP.4** Model with mathematics. (5-LS2-1)
- **MP.5** Use appropriate tools strategically. (5-LS2-1)
- **5.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-LS1-1)

**NOTE:**

*Grade 5, includes:

5-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

[Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.]

[Assessment Boundary: Assessment does not include molecular explanations.]

Chapter 4 Performance Expectation Activity, 195c

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
</table>
| Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.  
  - Develop a model to describe phenomena. (5-LS2-1) | • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1) | • A system can be described in terms of its components and their interactions. (5-LS2-1) |
| TE Only: 143, SEP: Developing and Using Models; 163, Science Notebook; 195a, Performance Expectation Activity; 195c, Performance Expectation Activity | TE Only: 142, Predict; 165a, Explore It!; 165b, Lesson 2 Check – Questions 1-7; 187a, Chapter 4 Test – Questions 4, 5; 187b, Chapter 4 Test – Questions 8, 9, 10; 195a, Performance Expectation Activity; 195a, ELA/Literacy; 195c, Performance Expectation Activity; 195c, ELA/Literacy |
| Connections to Nature of Science | Connection to Nature of Science |
| Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena | Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena |
| • Science explanations describe the mechanisms for natural events. (5-LS2-1) | SE/TE: 151, Plants and Energy; 158-165, Lesson 2; 167, Environmental Changes; 176, Nonnative Species; 186, Chapter Review – Lesson 2; 188, Benchmark Practice – Questions 3, 4, 5; 195, Create a Food Web Model |
| SE/TE: 144, Try It!; 151, Plants and Energy; 158, Explore It!; 162, Food Chains; 163, Food Webs; 348-349, Investigate It! | TE Only: 142, CCC: Systems and System Models; 195a, Performance Expectation Activity |
| TE Only: 152, Elaborate; 153, 21st Century Learning; 157, Differentiated Instruction; 165a, Explore It!; 349a-349d Activity Card Support | TE Only: 142, Predict; 165a, Explore It!; 165b, Lesson 2 Check – Questions 1-7; 187a, Chapter 4 Test – Questions 4, 5; 187b, Chapter 4 Test – Questions 8, 9, 10; 195a, Performance Expectation Activity; 195a, ELA/Literacy; 195c, Performance Expectation Activity; 195c, ELA/Literacy |

LS2.B: Cycles of Matter and Energy
### Transfer in Ecosystems
- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

**SE/TE:** 151, Plants and Energy; 154-155, Photosynthesis; 159, Interactions in Ecosystems; 162, Food Chains; 163, Food Webs; 186, Chapter Review – Lessons 1, 2; 189, Go Green!

**TE Only:** 157b, Lesson 1 Check – Questions 1, 4, 6; 165b, Lesson 2 Check – Questions 1-5; 187b, Chapter 4 Test – Question 9; 195a, Performance Expectation Activity; 195c, Performance Expectation Activity

**Connections to other DCIs in fifth grade:** 5.ESS2.A (5-LS2-1); 5.PS1.A (5-LS2-1)

**Articulation of DCIs across grade-bands:** 2.PS1.A (5-LS2-1); 2.LS4.D (5-LS2-1); 4.ESS2.E (5-LS2-1); MS.LS1.C (5-LS2-1); MS.LS2.A (5-LS2-1); MS.LS2.B (5-LS2-1)

**Common Core State Standards Connections:**

**ELA/Literacy –**
- **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. (5-LS2-1)
- **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-LS2-1)

**Mathematics –**
- **MP.2** Reason abstractly and quantitatively. (5-LS2-1)
- **MP.4** Model with mathematics. (5-LS2-1)
5-ESS1 Earth’s Place in the Universe

Students who demonstrate understanding can:

5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.
[Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]
Chapter 6 Performance Expectation Activity, 313c

5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
[Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.]
[Assessment Boundary: Assessment does not include causes of seasons.]
Chapter 6 Performance Expectation Activity, 313d

The performance expectations above were developed using the following elements from the NRC document _A Framework for K-12 Science Education_:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzing and Interpreting Data</strong></td>
<td><strong>ESS1.A: The Universe and its Stars</strong></td>
<td><strong>Patterns</strong></td>
</tr>
<tr>
<td>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.</td>
<td>- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)</td>
<td>- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)</td>
</tr>
<tr>
<td>TE Only: xlvi-xlvii, QUEST; 313a, Mathematics; 313b, Performance Expectation Activity; 313d, ELA/Literacy; 313d, Performance Expectation Activity</td>
<td><strong>SE/TE:</strong> 271–275, Lesson 2</td>
<td><strong>SE/TE:</strong> 275, Stars on the Move; 313, Model a Planet’s Orbit</td>
</tr>
<tr>
<td>Engaging in Argument from Evidence</td>
<td><strong>TE Only:</strong> 275b, Lesson 2 Check – Question 4; 313c, Performance Expectation Activity; 313c, ELA/Literacy; 313c, Mathematics</td>
<td><strong>TE Only:</strong> xlvi-xlvii, QUEST; 256, CCC: Patterns; 313d, Performance Expectation Activity; 313d, ELA/Literacy</td>
</tr>
<tr>
<td>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).</td>
<td><strong>ESS1.B: Earth and the Solar System</strong></td>
<td><strong>Scale, Proportion, and Quantity</strong></td>
</tr>
<tr>
<td>• Support an argument with evidence, data, or a model. (5-ESS1-1)</td>
<td>- The orbits of Earth around the sun and the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)</td>
<td>- Natural objects exist from the very small to the immensely large. (5-ESS1-1)</td>
</tr>
<tr>
<td>TE Only: 53, Engaging in Argument from Evidence; 99e, Performance Expectation Activity; 99e, ELA/Literacy; 257, SEP: Engaging in Argument from Evidence; 313c, Performance Expectation Activity; 313c, ELA/Literacy</td>
<td><strong>SE/TE:</strong> 264–269, Lesson 1; 272, Lightning Lab; 274, Constellations; 275, Stars on the Move; 278, Orbiting Objects; 281, Earth and Moon; 304, Chapter Review – Lesson 1; 306, Benchmark Practice – Question 5</td>
<td><strong>SE/TE:</strong> 271, Stars; 272, Lightning Lab; 279, Mercury; 284, Explore It!; 285, Gas Giants; 289, Exploring the Giants; 292, Meteors; 293, Comets; 294, Dwarf Planets</td>
</tr>
<tr>
<td><strong>TE Only:</strong> xlvi-xlvii, QUEST; 269a, Explore It!; 269b, Lesson 1 Check – Questions 1-6; 281, Science Notebook; 305a, Chapter 6 Test – Question 1; 305b, Chapter 6 Test – Question 9; 313d, Performance Expectation Activity; 313d, ELA/Literacy; 313d, Mathematics</td>
<td><strong>TE Only:</strong> 256G–256H, Leveled Content Reader Support; 289a, Explore It!</td>
<td></td>
</tr>
</tbody>
</table>
**Connections to other DCIs in fifth grade:** N/A

**Articulation of DCIs across grade-bands:**
- 1.ESS1.A (5-ESS1-2)
- 1.ESS1.B (5-ESS1-2)
- 3.PS2.A (5-ESS1-2)
- MS.ESS1.A (5-ESS1-1), (5-ESS1-2)
- MS.ESS1.B (5-ESS1-1), (5-ESS1-2)

**Common Core State Standards Connections:**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI.5.1</td>
<td>Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS1-1)</td>
</tr>
<tr>
<td>RI.5.7</td>
<td>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. (5-ESS1-1)</td>
</tr>
<tr>
<td>RI.5.8</td>
<td>Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-ESS1-1)</td>
</tr>
<tr>
<td>RI.5.9</td>
<td>Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS1-1)</td>
</tr>
<tr>
<td>W.5.1</td>
<td>Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-ESS1-1)</td>
</tr>
<tr>
<td>SL.5.5</td>
<td>Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2)</td>
</tr>
</tbody>
</table>

**Mathematics –**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP.2</td>
<td>Reason abstractly and quantitatively. (5-ESS1-1), (5-ESS1-2)</td>
</tr>
<tr>
<td>MP.4</td>
<td>Model with mathematics. (5-ESS1-1), (5-ESS1-2)</td>
</tr>
<tr>
<td>5.NBT.A.1</td>
<td>Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-ESS1-1)</td>
</tr>
<tr>
<td>5.G.A.2</td>
<td>Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)</td>
</tr>
</tbody>
</table>
### 5-ESS2 Earth’s Systems

**5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.**

[Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

Chapter 5 Performance Expectation Activity, 313a

See also Grade 4, Lesson 6.5.

**5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.**

[Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]

Chapter 5 Performance Expectation Activity, 313b

See also Grade 4, Lesson 6.5.

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

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
</table>
| **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. | **ESS2.A: Earth Materials and Systems** Earth’s major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth’s surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1) | **Scale, Proportion, and Quantity**  
- Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2) |
| **SE/TE:** 198, Try It!; 200-203, STEM Activity; 224, Explore It!; 313, Landforms and Weather | **SE/TE:** 4–7, STEM Activity; 206-207, The Water Cycle; 210-215, Lesson 2; 216-223, Lesson 3; 224, Explore It!; 228-229, Types of Clouds; 234, Bodies of Water; 252, Chapter Review – Lessons 1, 2, 3; 253, Chapter Review – Lesson 4; 254, Benchmark Practice – Question 2; 313, Landforms and Weather; 318-321, STEM Activity | |
| **TE Only:** 197, SEP: Developing and Using Models; 207, Differentiated Instruction; 214, Differentiated Instruction; 229a, Explore It!; 313a, Performance Expectation Activity; 313a, ELA/Literacy | **TE Only:** 198, Teacher Background; 209, Professional Development Note; 215a, My Planet Diary; 215b, Lesson 2 Check – Questions 1-6; 229a, Explore It!; 229b, Lesson 4 Check – Questions 5, 6; 253a, Chapter 5 Test – Questions 3, 5; Chapter 5 Test – Question 9; 313a, Performance Expectation Activity; 313a, ELA/Literacy | |
| **Using Mathematics and Computational Thinking** Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions | **ESS2.C: The Roles of Water in Earth’s** | |
| **SE/TE:** 178-179, Investigate It!; 209, Do the Math; 213, Do the Math! | **SE/TE:** 206-207, The Water Cycle; 211, The Earth as a System | |
| **TE Only:** 179a-179c, Activity Card Support; 313a, Mathematics; 313b, Performance Expectation Activity; 313b, ELA/Literacy | **TE Only:** 196, CCC: Systems and System Models; 313a, Performance Expectation Activity; 313a, ELA/Literacy; 313a, Mathematics | |
### Surface Processes
- Nearly all of Earth’s available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

**SE/TE:** 206-207, The Water Cycle; 212, Atmosphere; 213, Hydrosphere; 213, Lightning Lab; 234, Bodies of Water; 238-239, Water Erosion and Deposition

**TE Only:** 196C, Teacher Background; 196G-196H, Leveled Content Reader Support; 206, Common Misconception; 213, Differentiated Instruction; 313b, Performance Expectation Activity

**Connections to other DCIs in fourth grade:** N/A

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

**Common Core State Standards Connections:**

- **ELA/Literacy**
  - 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. (5-ESS2-1), (5-ESS2-2)
  - 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. (5-ESS2-2)
  - SL.5.5: Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS2-1), (5-ESS2-2)

- **Mathematics**
  - MP.2: Reason abstractly and quantitatively. (5-ESS2-1), (5-ESS2-2)
  - MP.4: Model with mathematics. (5-ESS2-1), (5-ESS2-2)
  - 5.G.A.2: Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)
5-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

Chapter 4 Performance Expectation Activity, 195d

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obtaining, Evaluating, and Communicating Information</strong> 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. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)</td>
<td><strong>ESS3.C: Human Impacts on Earth Systems</strong> • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments. (5-ESS3-1)</td>
<td><strong>Systems and System Models</strong> • A system can be described in terms of its components and their interactions. (5-ESS3-1)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 176, Go Green!; 195, Local Resources</td>
<td><strong>SE/TE:</strong> 169, Changes Caused by Humans; 174-177, Lesson 4; 178-179, Investigate It!; 187, Chapter Review – Lesson 4; 188, Benchmark Practice; 189, Create a Compost Pile; 195, Local Resources</td>
<td><strong>SE/TE:</strong> 206-207, The Water Cycle; 211, The Earth as a System</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 176, 21st Century Learning; 177, Science – Writing; 180, Science Notebook; 195d, Performance Expectation Activity; 195d, ELA/Literacy; 196G-196H, Leveled Content Reader Support; 215, 21st Century Learning; 313a, Performance Expectation Activity; 313a, ELA/Literacy; 313a, Mathematics</td>
<td><strong>TE Only:</strong> 142D, Teacher Background; 142G-142H, Leveled Content Reader Support; 173a, My Planet Diary; 177a, Explore It!; 177b, Lesson 4 Check – Questions 5, 6; 179a-179d, Activity Card Support; 195d, Performance Expectation Activity; 195d, ELA/Literacy; 215, 21st Century Learning</td>
<td><strong>TE Only:</strong> 196, CCC: Systems and System Models; 313a, Performance Expectation Activity; 313a, ELA/Literacy; 313a, Mathematics</td>
</tr>
<tr>
<td><strong>SE/TE Only:</strong> 196, CCC: Systems and System Models; 313a, Performance Expectation Activity; 313a, ELA/Literacy; 313a, Mathematics</td>
<td><strong>TE Only:</strong> 177a, Explore It!; 179a-179d, Activity Card Support; 195d, Performance Expectation Activity</td>
<td></td>
</tr>
</tbody>
</table>

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-bands: **MS.ESS3.A** (5-ESS3-1); **MS.ESS3.C** (5-ESS3-1); **MS.ESS3.D** (5-ESS3-1)

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. (5-ESS3-1)

**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. (5-ESS3-1)

**RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)

**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. (5-ESS3-1)

**W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)

**Mathematics –**

**MP.2** Reason abstractly and quantitatively. (5-ESS3-1)

**MP.4** Model with mathematics. (5-ESS3-1)
## 5-PS1 Matter and its interactions

Students who demonstrate understanding can:

**5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.**  
[Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

Chapter 1 Performance Expectation Activity, 99a

**5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.**  
[Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]

Chapter 1 Performance Expectation Activity, 99b

**5-PS1-3. Make observations and measurements to identify materials based on their properties.**  
[Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]

Chapter 1 Performance Expectation Activity, 99c

**5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**

Chapter 1 Performance Expectation Activity, 99d

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
</table>
| **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.  
  • Develop a model to describe phenomena. (5-PS1-1)  
  SE/TE: 4-7, STEM Activity; 13, Lightning Lab; 16, Explore It!; 34, Explore It!; 36, At-Home Lab  
  TE Only: 9, ELA Support; 12, Differentiated Instruction; 15, RTI: Response to Intervention; 21a, Explore It!; 39a, Explore It!; 54, 99a, Performance Expectation Activity  
  **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.  
  • 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. (5-PS1-4)  
  SE/TE: 16, Explore It!; 38, Lightning Lab; 40-41, Investigate It!; 98, Plan an Investigation; 99, Investigate Mixtures; 348-349, Investigate It!  
  TE Only: 21a, Explore It!; 30, Professional Development Note; 41a-41d, Activity Card Support; 99d, Performance Expectation Activity  
  • Make observations and measurements to produce data to serve as the basis for  
  **PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model shows that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects. (5-PS1-1)  
  SE/TE: 8, My Planet Diary; 9, Matter; 12, Atoms; 13, Atomic Arrangement; 14-15, Compounds; 48, Chapter Review – Lesson 1  
  TE Only: 1C-1D, Teacher Background; 1G-1H, Leveled Content Reader Support; 8, Common Misconception; 15, Professional Development Note; 15a, My Planet Diary; 15b, Lesson 1 Check – Questions 1, 3, 4; 49a, Chapter 1 Test – Question 5; 99a, Performance Expectation Activity  
  • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)  
  SE/TE: 2, Try It!; 9, Matter  
  TE Only: 1C, Teacher Background; 99b, Performance Expectation Activity; 99b, ELA/Literacy; 99b, Mathematics  
  • Measurements of a variety of  
  **Cause and Effect**  
  • Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)  
  SE/TE: 16, Explore It!; 22, Explore It!; 34, Explore It!  
  TE Only: 21a, Explore It!; 27a, Explore It!; 27b, Lesson 3 Check – Question 6; 32, 21st Century Learning; 52  
  **Scale, Proportion, and Quantity**  
  • Natural objects exist from the very small to the immensely large. (5-PS1-1)  
  SE/TE: 1, What makes up these giant crystals?; 9, Matter; 12, Atoms; 13, Atomic Arrangement; 48, Chapter Review – Lesson 1  
  TE Only: 1G-1H, Leveled Content Reader Support; 1I, Read Aloud; 1I, Professional Development Note; 15b, Lesson 1 Check – Questions 1, 3, 4; 49a, Chapter 1 Test – Question 5; 99a, Performance Expectation Activity  
  • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5-PS1-3)  
  SE/TE: 2, Try It!; 19, Volume; 20, Temperature; 24, Solids, Liquids, Gases, Plasmas; 26, Do the Math!; 48, Chapter Review – Lesson 3; 336, Explore It!; 342, Lightning Lab; EM1, Measurements
Evidence for an explanation of a phenomenon. (5-PS1-3)

**SE/TE:** 16, Explore It!; 22, Explore It!; 25, Lightning Lab; 28, Explore It!; 34, Explore It!; 98, Plan an Investigation

**336, Explore It!; 344, Explore It!**

**TE Only:** 21a, Explore It!; 27a, Explore It!; 33a, Explore It!; 39a, Explore It!; 99b, Performance Expectation Activity; 99c, Performance Expectation Activity; 343a, Explore It!; 347a, Explore It!

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

**SE/TE:** 2, Try It!

**TE Only:** 1, SEP: Using Mathematics and Computational Thinking; 99b, Performance Expectation Activity

**PS1.B: Chemical Reactions**

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)

**SE/TE:** 14-15, Compounds; 37, Chemical Changes; 38-39, Temperature and Chemical Changes; 42, Sidewalks and Playgrounds; 49, Chapter Review – Lessons 4 and 5; 50, Benchmark Practice – Questions 8, 9; 99, Investigate Mixtures

**TE Only:** 1G-1H, Leveled Content Reader Support; 39b, Lesson 5 Check – Questions 2, 5, 6; 49b, Chapter 1 Test – Question 8; 99d, Performance Expectation Activity; 99d, ELA/Literacy

- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

**SE/TE:** 2, Try It!; 9, Matter

**TE Only:** 1C, Teacher Background; 99b, Performance Expectation Activity; 99b, ELA/Literacy; 99b, Mathematics

**Connections to other DCIs in fifth grade:** N/A

**Articulation of DCIs across grade-bands:** 2, PS1.A (5-PS1-1); 2, PS1.B (5-PS1-2); 2, PS1.B (5-PS1-2); MS, PS1.A (5-PS1-1); MS, PS1.B (5-PS1-2)

**Connections to Nature of Science**

Science assumes consistent patterns in natural systems. (5-PS1-2)

**SE/TE:** 2, Try It!; 20, Temperature; 22, Explore It!; 25, Freezing and Melting; 26, Evaporation; 27, Condensation

**TE Only:** 27a, Explore It!

**Articulation of DCIs across grade-bands:** 2, PS1.A (5-PS1-1); 2, PS1.B (5-PS1-2); MS, PS1.A (5-PS1-1); MS, PS1.B (5-PS1-2)
<table>
<thead>
<tr>
<th>Common Core State Standards Connections:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELA/Literacy</strong> –</td>
</tr>
<tr>
<td><strong>RI.5.7</strong> 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. <em>(5-PS1-1)</em></td>
</tr>
<tr>
<td><strong>W.5.7</strong> Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. <em>(5-PS1-2),(5-PS1-3),(5-PS1-4)</em></td>
</tr>
<tr>
<td><strong>W.5.8</strong> 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. <em>(5-PS1-2),(5-PS1-3),(5-PS1-4)</em></td>
</tr>
<tr>
<td><strong>W.5.9</strong> Draw evidence from literary or informational texts to support analysis, reflection, and research. <em>(5-PS1-2),(5-PS1-3),(5-PS1-4)</em></td>
</tr>
<tr>
<td><strong>Mathematics</strong> –</td>
</tr>
<tr>
<td><strong>MP.2</strong> Reason abstractly and quantitatively. <em>(5-PS1-1),(5-PS1-2),(5-PS1-3)</em></td>
</tr>
<tr>
<td><strong>MP.4</strong> Model with mathematics. <em>(5-PS1-1),(5-PS1-2),(5-PS1-3)</em></td>
</tr>
<tr>
<td><strong>MP.5</strong> Use appropriate tools strategically. <em>(PS1-2),(PS1-3)</em></td>
</tr>
<tr>
<td><strong>S.NBT.A.1</strong> Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. <em>(5-PS1-1)</em></td>
</tr>
<tr>
<td><strong>S.NF.B.7</strong> Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. <em>(5-PS1-1)</em></td>
</tr>
<tr>
<td><strong>S.MD.A.1</strong> Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. <em>(5-PS1-2)</em></td>
</tr>
<tr>
<td><strong>S.MD.C.3</strong> Recognize volume as an attribute of solid figures and understand concepts of volume measurement. <em>(5-PS1-1)</em></td>
</tr>
<tr>
<td><strong>S.MD.C.4</strong> Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. <em>(5-PS1-1)</em></td>
</tr>
</tbody>
</table>
### 5-PS2 Motion and Stability: Forces and Interactions

**Students who demonstrate understanding can:**

**5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.** [Clarification Statement: “Down” is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

Chapter 2 Performance Expectation Activity, 99e

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engaging in Argument from Evidence</strong></td>
<td><strong>PS2.B: Types of Interactions</strong></td>
<td></td>
</tr>
<tr>
<td>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).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Support an argument with evidence, data, or a model. (5-PS2-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TE Only:</strong> 53, Engaging in Argument from Evidence; 99e, Performance Expectation Activity; 99e, ELA/Literacy; 257, SEP: Engaging in Argument from Evidence; 313c, Performance Expectation Activity; 313c, ELA/Literacy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Cause and Effect** |
| Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) |

**SE/TE:** 60, My Planet Diary, 64, Gravity; 64, At-Home Lab; 74, Explore It!; 76-77, Balanced Forces; 218, Barometric Pressure; 238-239, Water Erosion and Deposition

**TE Only:** 65, RTI: Response to Intervention; 77a, Explore It!; 99e, Performance Expectation Activity; 99e, ELA/Literacy

**Connections to other DCIs in fifth grade:** N/A

**Articulation of DCIs across grade-bands:** 3.PS2.A (5-PS2-1); 3.PS2.B (5-PS2-1); MS.PS2.B (5-PS2-1); MS.ESS1.B (5-PS2-1); MS.ESS2.C (5-PS2-1)

**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. (5-PS2-1)

**RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1)

**W.5.1** Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1)
### 5-PS3 Energy

Students who demonstrate understanding can:

**5-PS3-1. Use models to describe that energy in animals’ food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** [Clarification Statement: Examples of models could include diagrams, and flow charts.]

Chapter 4 Performance Expectation Activity, 195a
Chapter 4 Performance Expectation Activity, 195c

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)</td>
<td>• Energy can be transferred in various ways and between objects. (5-PS3-1)</td>
</tr>
<tr>
<td></td>
<td>SE/TE: 37, Chemical Changes; 112-113, Structures for Respiration and Circulation; 150-157, Lesson1; 186, Chapter Review, Lesson 1</td>
<td>SE/TE: 151, Plants and Energy; 162, Food Chains; 163, Food Webs</td>
</tr>
<tr>
<td></td>
<td>TE Only: 157b, Lesson 1 Check – Questions 3, 6; 187a, Chapter 1 Test – Questions 1, 3; 195a, Performance Expectation Activity; 195c, Performance Expectation Activity; 195c, ELA/Literacy</td>
<td>TE Only: 100, CCC: Energy and Matter; 154, Differentiated Instruction; 195a, Performance Expectation Activity</td>
</tr>
<tr>
<td></td>
<td>• Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SE/TE: 151, Plants and Energy; 156-157, Respiration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TE Only: 195a, Performance Expectation Activity</td>
<td></td>
</tr>
</tbody>
</table>

**Connections to other DCIs in fifth grade:** N/A

**Articulation of DCIs across grade-bands:**

- MS.PS3.D (5-PS3-1)
- MS.PS4.B (5-PS3-1)
- MS.LS1.C (5-PS3-1)
- MS.LS2.B (5-PS3-1)

**Common Core State Standards Connections:**

- **ELA/Literacy – 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. (5-PS3-1)

- **SL.5.5**
  
  Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-PS3-1)
### 3-5-ETS1 Engineering Design

Students who demonstrate understanding can:

#### 3-5-ETS1-1. Defining a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

- **Performance Based Assessment:** Build a Simple Machine, 98
- **Come In Out of Nature!** STEM Activity, 104-107
- **Let It Self-Water!** STEM Activity, 146-149
- **Filter It Out!** STEM Activity, 200-203
- **Where’s the Wind Going?** STEM Activity, 318-321
- **Is Your Arm a Simple Machine?** STEM Activity, 364-367

#### 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.

- **Watch It Fly!** STEM Activity, 56-59
- **Performance Based Assessment:** Local Resources, 195
- **Filter It Out!** STEM Activity, 200-203
- **Explore It! Which transport system works best?** 368
- **Design It! How much weight can a model arm support?** 398-402

#### 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.

- **Watch It Fly!** STEM Activity, 56-59
- **Let It Self-Water!** STEM Activity, 146-149
- **Breathe Deeply!** STEM Activity, 260-263
- **Where’s the Wind Going?** STEM Activity, 318-321
- **Design It! How much weight can a model arm support?** 398-402
- **Performance Based Assessment:** Make a Model, 404

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education:*

<table>
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<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 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)</td>
<td>- 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 meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)</td>
<td>- People’s needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)</td>
</tr>
<tr>
<td><strong>SE/TE:</strong> 4, Identify the Problem; 56, Identify the Problem; 104, Identify the Problem; 146, Identify the Problem; 200, Identify the Problem; 260, Identify the Problem; 318, Identify the Problem; 364, Identify the Problem; 383, Identify the Problem; 398, Identify the Problem</td>
<td><strong>SE/TE:</strong> 4-7, STEM Activity; 56-59, STEM Activity; 104-107, STEM Activity; 146-149, STEM Activity; 200-203, STEM Activity; 260-263, STEM Activity; 318-321, STEM Activity; 364-367, STEM Activity; 381-385, Design Process; 398-403, Design It!</td>
<td>- <strong>SE/TE:</strong> 363, Technology and Our Homes; 368-369, Envision it!; 369-373, Lesson 1; 374-379, Lesson 2; 386-387, Designing Robotic Arms; 390, Denim Insulation; 394, Chapter Review – Lessons 1, 2</td>
</tr>
<tr>
<td><strong>TE Only:</strong> 315: SEP: Asking Questions and Defining Problems</td>
<td><strong>ETS1.B: Developing Possible Solutions</strong></td>
<td>- <strong>TE Only:</strong> 373b, Lesson 1 Check – Questions 1-6; 379a, My Planet Diary; 379b, Lesson 2 Check – Questions 1-6</td>
</tr>
</tbody>
</table>
|   - 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) |   - Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2) |   - **SE/TE:** 359, Flight Simulators; 361, Predict; 363, Technology and Our Homes; 369, Problems and Solutions; 370-371, Tools in Medicine; 374, My Planet Diary; 375-377, Technology and...
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. (3–5-ETS1-3)

SE/TE: 4-7, STEM Activity; 56-59, STEM Activity; 104-107, STEM Activity; 146-149, STEM Activity; 200-203, STEM Activity; 260-263, STEM Activity; 318-321, STEM Activity; 364-367, STEM Activity; 381-385, Design Process; 398-403, Design It!

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)

SE/TE: 4-7, STEM Activity; 56-59, STEM Activity; 104-107, STEM Activity; 146-149, STEM Activity; 200-203, STEM Activity; 260-263, STEM Activity; 318-321, STEM Activity; 364-367, STEM Activity; 381-385, Design Process; 398-403, Design It!

TE Only: 361, SEP: Constructing Explanations and Designing Solutions

SE/TE: 4-5, Do Research; 56-57, Do Research; 104-105, Do Research; 146, Do Research; 200, Do Research; 260-261, Do Research; 318-319, Do Research; 364-365, Do Research; 382, Do Research; 399, Do Research

- 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)

SE/TE: 385, Communicate Results
TE Only: 5, Pre-Activity Discussion; 6, Post-Activity Discussion; 57, Pre-Activity Discussion; 58, Post-Activity Discussion; 105, Pre-Activity Discussion; 106, Post-Activity Discussion; 147, Pre-Activity Discussion; 148, Post-Activity Discussion; 201, Pre-Activity Discussion; 202, Post-Activity Discussion; 261, Pre-Activity Discussion; 262, Post-Activity Discussion; 319, Pre-Activity Discussion; 320, Post-Activity Discussion; 365, Pre-Activity Discussion; 366, Post-Activity Discussion

- 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)

SE/TE: 6, Test the Prototype; 59, Test the Prototype; 106, Test the Prototype; 148, Test the Prototype; 202, Test the Prototype; 262-263, Test the Prototype; 320, Test the Prototype; 366, Test the Prototype; 384, Test the Prototype

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)

SE/TE: 7, Evaluate and Redesign; 59, Evaluate and Redesign; 106-107, Evaluate and Redesign; 149, Evaluate and Redesign; 203, Evaluate and Redesign; 263, Evaluate and Redesign; 321, Evaluate and Redesign; 367, Evaluate and Redesign; 385, Evaluate and Redesign; 403, Evaluate and Redesign

the Human Body; 378, Animals and Technology; 379, Nanobots; 381-385, Design Process; 386-387; 390, Denim Insulation; 394, Chapter Review – Lesson 2; 395, Chapter Review – Lesson 3; 396, Benchmark Practice – Questions 2, 3, 5; 397, Infrared Technology

TE Only: 360G-360H, Leveled Content Reader Support; 360, CCC: Influence of Engineering, Technology, and Science on Society and the Natural World; 379a, My Planet Diary; 379b, Lesson 2 Check
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.ETS1.A (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3); K.ETS1.B (3-5-ETS1-2); K.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)

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-ETS2)
- 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-ETS2)

**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)
- 3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1), (3-5-ETS1-2)

*This performance expectation integrates traditional science content with engineering through a practice or disciplinary core idea.*