Second Grade

The performance expectations in second grade help students formulate answers to questions such as: “How does land change and what are some things that cause it to change? What are the different kinds of land and bodies of water? How are materials similar and different from one another, and how do the properties of the materials relate to their use? What do plants need to grow? How many types of living things live in a place?” Second grade performance expectations include PS1, LS2, LS4, ESS1, ESS2, and ETS1 Disciplinary Core Ideas from the *NRC Framework*. Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students are also expected to compare the diversity of life in different habitats. An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials. Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change. Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth. The crosscutting concepts of patterns; cause and effect; energy and matter; structure and function; stability and change; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the second grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.
### 2. Structure and Properties of Matter

#### Science and Engineering Practices

**Planning and Carrying Out Investigations**
- Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
  - Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)

**Analyzing and Interpreting Data**
- Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
  - Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)

**Constructing Explanations and Designing Solutions**
- Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).
  - Construct an argument with evidence to support a claim. (2-PS1-4)

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#### Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**
- Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
- Different properties are suited to different purposes. (2-PS1-2, 2-PS1-3)
- A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

**PS1.B: Chemical Reactions**
- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)

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#### Crosscutting Concepts

**Patterns**
- Patterns in the natural and human designed world can be observed. (2-PS1-1)

**Cause and Effect**
- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

**Energy and Matter**
- Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

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#### Connections to Nature of Science

- **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**
  - Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)

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### Articulation of DCIs across grade-levels: 4.ESS2.A (2-PS1-3); 5.SPS1.A (2-PS1-1, 2-PS1-2, 2-PS1-3); 5.PS1.B (2-PS1-4); 5.LS2.A (2-PS1-3)

### Common Core State Standards Connections:

**ELA/Literacy –**

**RI.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4)

**RI.2.3** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4)

**RI.2.8** Describe how reasons support specific points the author makes in a text. (2-PS1-2, 2-PS1-4)

**W.2.1** Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-2, 2-PS1-3)

**W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1, 2-PS1-2, 2-PS1-3)

**W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1, 2-PS1-2, 2-PS1-3)

**MP.2** Reason abstractly and quantitatively. (2-PS1-2)

**MP.4** Model with mathematics. (2-PS1-1, 2-PS1-2)

**MP.5** Use appropriate tools strategically. (2-PS1-2)

**2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-PS1-1, 2-PS1-2)

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

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2. Interdependent Relationships in Ecosystems

Students who demonstrate understanding can:

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.]

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

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>Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</td>
<td></td>
<td></td>
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<tr>
<td>• Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2–2)</td>
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</tr>
<tr>
<td>Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</td>
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<tr>
<td>• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)</td>
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<tr>
<td>• Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)</td>
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</tr>
<tr>
<td>Connections to Nature of Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific Knowledge is Based on Empirical Evidence</td>
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</tr>
<tr>
<td>• Scientists look for patterns and order when making observations about the world. (2-LS4-1)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Articulation of DCIs across grade-levels:</th>
<th>Common Core State Standards Connections:</th>
</tr>
</thead>
<tbody>
<tr>
<td>K.LS1.C (2-LS2-1); K.ES5S.3.A (2-LS2-1); K.ETS1.A (2-LS2-2); 3.LS4.C (2-LS4-1); 3.LS4.D (2-LS4-1); 5.LS1.C (2-LS2-1); 5.LS2.A (2-LS2-2), (2-LS4-1)</td>
<td></td>
</tr>
<tr>
<td>W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1), (2-LS4-1)</td>
<td></td>
</tr>
<tr>
<td>W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1), (2-LS4-1)</td>
<td></td>
</tr>
<tr>
<td>S.L.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2)</td>
<td></td>
</tr>
<tr>
<td>MP.2 Reason abstractly and quantitatively. (2-LS2-1), (2-LS4-1)</td>
<td></td>
</tr>
<tr>
<td>MP.4 Model with mathematics. (2-LS2-1), (2-LS2-2), (2-LS4-1)</td>
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<td>MP.5 Use appropriate tools strategically. (2-LS2-1)</td>
<td></td>
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<tr>
<td>2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS2-1), (2-LS4-1)</td>
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</tbody>
</table>

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# 2. Earth’s Systems: Processes that Shape the Earth

**Science and Engineering Practices**

**Developing and Using Models**
- Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
  - Develop a model to represent patterns in the natural world. (2-ESS2-2)

**Constraining Explanations and Designing Solutions**
- Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
  - Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)
  - Compare multiple solutions to a problem. (2-ESS2-1)

**Obtaining, Evaluating, and Communicating Information**
- Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information.
  - Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

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**Disciplinary Core Ideas**

<table>
<thead>
<tr>
<th>ESS1.C: The History of Planet Earth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ESS2.A: Earth Materials and Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind and water can change the shape of the land. (2-ESS2-1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ESS2.B: Plate Tectonics and Large-Scale System Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ESS2.C: The Roles of Water in Earth’s Surface Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ETS1.A: Optimizing the Design Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (secondary to 2-ESS2-1)</td>
</tr>
</tbody>
</table>

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**Crosscutting Concepts**

**Patterns**
- Patterns in the natural world can be observed. (2-ESS2-2), (2-ESS2-3)

**Stability and Chang e**
- Things may change slowly or rapidly. (2-ESS1-1), (2-ESS2-1)

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

**Influence of Engineering, Technology, and Science on Society and the Natural World**
- Developing and using technology has impacts on the natural world. (2-ESS2-1)

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**Connections to Nature of Science**

**Science Addresses Questions about the Natural and Material World**
- Scientists study the natural and material world. (2-ESS2-1)

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**Articulation of DCIs across grade-levels:**
- ETS1.A (2-ESS2-1); 3.LS2.C (2-ESS1-1); 4.ESS1.C (2-ESS1-1); 4.ESS2.A (2-ESS1-1), (2-ESS2-1); 4.ESS2.B (2-ESS2-2); 4.ETS1.A (2-ESS2-1); 4.ETS1.B (2-ESS2-1); 4.ETS1.C (2-ESS2-1); 5.ESS2.A (2-ESS2-1); 5.ESS2.C (2-ESS2-1)

**Common Core State Standards Connections:**

**ELA/Literacy**
- R1.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ESS1-1)
- R1.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, steps in technical procedures in a text. (2-ESS1-1), (2-ESS2-1)
- R1.2.9 Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)
- R1.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS1-1), (2-ESS2-3)
- W2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)
- W2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1), (2-ESS2-3)
- SL2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1)
- SL2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-ESS2-2)

**Mathematics**
- MP.2 Reason abstractly and quantitatively. (2-ESS2-1), (2-ESS2-2)
- MP.4 Model with mathematics. (2-ESS1-1), (2-ESS2-1), (2-ESS1-1), (2-ESS2-2)
- MP.5 Use appropriate tools strategically. (2-ESS2-1)
- 2.NBT.A Understand place value. (2-ESS1-1)
- 2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2-ESS2-2)
- 2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2-ESS2-2)

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K-2. Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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

- Asking Questions and Defining Problems
  - Asking questions and defining problems in K-2 builds on prior experiences and progresses to simple descriptive questions.
  - Ask questions based on observations to find more information about the natural and/or designed world. (K-2-ETS1-1)
  - Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

- Developing and Using Models
  - Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or story board) that represent concrete events or design solutions.
  - Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

- Analyzing and Interpreting Data
  - Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
  - Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)

Disciplinary Core Ideas

- ETS1.A: Defining and Delimiting Engineering Problems
  - A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
  - Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
  - Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

- ETS1.B: Developing Possible Solutions
  - Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people. (K-2-ETS1-2)

- ETS1.C: Optimizing the Design Solution
  - Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)

Crosscutting Concepts

- Structure and Function
  - The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Connections to K-2-ETS1.A: Defining and Delimiting Engineering Problems include:

- Kindergarten: K-PS2-2, K-ESS3-2

Connections to K-2-ETS1.B: Developing Possible Solutions Problems include:

- Kindergarten: K-ESS3-3, First Grade: 1-PS4-4, Second Grade: 2-PS2-2

Connections to K-2-ETS1.C: Optimizing the Design Solution include:

- Second Grade: 2-ESS2-1

Articulation of DCIs across grade-bands:


Common Core State Standards Connections:

ELA/Literacy –

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1),(K-2-ETS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1),(K-2-ETS1-3)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

Mathematics –

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1),(K-2-ETS1-3)

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