3 Dimensions

Science & Engineering Practices

Crosscutting Concepts

Disciplinary Core Ideas

**Disciplinary Core Ideas**

**PHYSICAL SCIENCES**
- PS1: Matter and Its Interactions
- PS2: Motion and Stability: Forces and Interactions
- PS3: Energy
- PS4: Waves and Their Applications in Technologies for Information Transfer

**LIFE SCIENCES**
- LS1: From Molecules to Organisms: Structures and Processes
- LS2: Ecosystems: Interactions, Energy, and Dynamics
- LS3: Heredity: Inheritance and Variation of Traits
- LS4: Biological Evolution: Unity and Diversity

**EARTH AND SPACE SCIENCES**
- ESS1: Earth’s Place in the Universe
- ESS2: Earth’s Systems
- ESS3: Earth and Human Activity

**ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE**
- ETS1: Engineering Design
- ETS2: Links Among Engineering, Technology, Science, and Society

**Science and Engineering Practices**
1. Asking Questions (for science) and Defining Problems (for engineering)
2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
6. Constructing Explanations (for sci) and Designing Solutions (for eng)
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, and Communicating Information

**Crosscutting Concepts**
1. Patterns
2. Cause and Effect: Mechanisms and Explanation
3. Scale, Proportion, and Quantity
4. Systems and System Models
6. Structure and Function
7. Stability and Change

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### Inside the NGSS Box

#### What IsAssessed
A collection of several performance expectations describing what students should be able to do at the end of instruction.

#### Foundation Box
The practices, disciplinary core ideas, and crosscutting concepts from the Framework for K-12 Science Education that were used to form the performance expectations.

#### Connection Box
Places elsewhere in NGSS or in the Common Core State Standards that have connections to the performance expectations on this page.

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**Title**
The title for a set of performance expectations is not necessarily unique and may be reused at several different grade levels.

**MS-LS2 Ecosystems: Interactions, Energy, and Dynamics**

<table>
<thead>
<tr>
<th>Students who demonstrate understanding can:</th>
<th>MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]</td>
</tr>
</tbody>
</table>

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**Science and Engineering Practices**
- Developing and Using Models
  - Modeling in 6-8 builds on 5-6 experiences and progresses to developing, using, and refining models to describe, test, and predict more abstract phenomena and design systems.
  - Develop a model to describe phenomena. (MS-LS2-3)

- Engaging in Argument from Evidence
  -学生 should be able to use empirical evidence and scientific reasoning to support or refute claims for either experiences and progresses to constructing a convincing argument that supports or refutes claims for either evidence.
  - Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4)
  - Evaluate competing design solutions based on jointly developed scientific arguments and agreed-upon design criteria. (MS-LS2-5)

**Disciplinary Core Ideas**
- **LS2.B: Cycle of Matter andEnergy Transfer in Ecosystems**
  - Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers. (LS2.B-1)
  - The cycling of matter can be modeled at different levels of organization, from molecules to ecosystems. (LS2.B-2)

- **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**
  - Ecosystems are dynamic in nature; their characteristics can vary over time. (LS2.C-1)
  - Biodiversity describes the variety of species found in an ecosystem. (LS2.C-2)

**Crosscutting Concepts**
- **Energy and Matter**
  - The transfer of energy can be tracked as energy flows through a system. (LS2.C-3)

**Connections to Nature of Science**
- **Scientific Knowledge is Based on Empirical Evidence**
  - Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)

- **Engineering Connection**
  - There are systematic processes for evaluating solutions. (MS-LS2-5)

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**Disciplinary Core Ideas**
- **LS2.D: Biodiversity and Humans**
  - Changes in biodiversity can influence human health, such as food, energy, and medicines, as well as ecosystem services that humans rely on for example, waste assimilation and recycling. (LS2.D-1)

- **ETS.B: Developing Possible Solutions**
  - There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of the problem. (LS2.B-2)

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**Codes for Performance Expectations**
Every performance expectation has a unique code and items in the foundation box and connection box reference this code. In the connections to common core, italics indicate a potential connection rather than a required prerequisite connection.