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# **Framework for Fifth Grade Science**

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## **Introduction**

The performance expectations in fifth grade help students formulate answers to questions such as “How does a nurse log help other things live and grow? How can we make water healthy for all living things? How does changing the flow of water impact Earth’s systems, and how can humans help? And, how and why does what I see in the sky change?”.

Fifth grade performance expectations include Matter and Its Interactions (PS1), Motion and Stability: Forces and Interactions (PS2), Energy (PS3), From Molecules to Organisms: Structure and Processes (LS1), Ecosystems: Interactions, Energy, and Dynamics (LS2), Earth’s Place in the Universe (ESS1), Earth’s Systems (ESS2), Earth and Human Activity (ESS3), and Engineering Design (ETS).

Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals’ food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas. In the fifth 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; using mathematics and computational thinking; 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.

The amount of time individual students need to achieve science standards will vary. The external standards review committees assumed that students in fifth grade would be provided with approximately 150 minutes of instruction per week for 36 weeks.

Schools may take more or less time, depending on local factors that determine curriculum programming within a specific context. Science instruction may be a dedicated time in the school schedule or may be integrated with instruction of other subjects. The goal is for all students to have regular science instruction every year.

## **Model Curriculum Framework for Grade Five Science**

The NJDOE collaborated with OpenSciEd to develop the instructional and professional learning materials for the [model curriculum framework for fifth grade science.](https://openscied.org/curriculum/elementary-school/explore-the-curriculum/)

The instructional units are centered around real-world phenomena children encounter every day! In the model science curriculum framework, teaching science isn’t just about facts and figures; it’s about creating a science learning experience that sparks students’ curiosity and captures their imaginations. Through hands-on investigations and student-driven discussions, learners will embark on a journey of scientific exploration, building a strong foundation for science learning in middle school and beyond.

Before implementing these instructional materials in your classroom, educators are strongly encouraged to attend professional learning to ensure effective and informed usage. The Liberty Science Center is a certified provider of this professional learning and offers sessions designed to support educators in understanding and applying the material with confidence and fidelity.

For more information on scheduling or registering for professional learning opportunities, please visit [Liberty Science Center Professional Development](https://lsc.org/education/educators/professional-development).

## **Model Scope and Sequence**

**Unit 1: How does a nurse log help other things live and grow?**

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

5-PS3-1. Use models to describe that energy in animals’ food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

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

**Unit 2: How can we make water healthy for all living things?**

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.

5-PS1-3. Make observations and measurements to identify materials based on their properties.

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

3-5-ETS2-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS-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.

**Unit 3: How does changing the flow of water impact Earth’s systems, and how can humans help?**

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

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

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

5.PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

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.

**Unit 4: How and why does what I see in the sky change?**

5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.

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.

5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

## **Professional Learning Resources**

The [STEM Teaching Tools website](https://stemteachingtools.org/) has tools that can help you teach science, technology, engineering and math (STEM). Each tool is focused on a specific issue and leverages the best knowledge from research and practice.

[NextGenScience](https://ngs.wested.org/) works alongside educators to support the design of quality, coherent K–12 programs that align science standards, instructional materials, professional learning, and assessments to support meaningful science experiences for all students.

## **Attributions**

* The performance expectations referenced are based on the *Next Generation Science Standards: For States, By States* (NGSS), developed by the National Research Council, the National Science Teachers Association, the American Association for the Advancement of Science, and Achieve. © 2013 Achieve, Inc. on behalf of the twenty-six states and partners that collaborated on the NGSS. Available at <https://nap.nationalacademies.org/catalog/18290/next-generation-science-standards-for-states-by-states>
* The science and engineering practices, disciplinary core ideas, and crosscutting concepts referenced are based on the *Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*, developed by the National Research Council. © 2012 National Academy of Sciences. Published by the National Academies Press. Available at: <https://nap.nationalacademies.org/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts>
* Examples referencing mathematics connections are adapted from Appendix L: Connections to the Common Core State Standards for Mathematics, originally published by Achieve, Inc. as part of the Next Generation Science Standards (NGSS). © 2013 Achieve, Inc. Used with permission. Available at [www.nextgenscience.org](https://www.nextgenscience.org/sites/default/files/resource/files/Appendix-L_CCSS%20Math%20Connections%2006_03_13.pdf).
* The Model Science Curriculum Framework and the Model Scope and Sequence are adapted from OpenSciEd Grade 5 Instructional Materials originally developed by The OpenSciEd Project of the National Center for Civic Innovation. © 2023 National Center for Civic Innovation Licensed under the Creative Commons Attribution Non-Commercial 4.0 International License (CC-BY-NC). Available at [www.openscied.org](http://www.openscied.org).

## **PS1: Matter and Its Interactions**

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.
(Clarification Statement: Examples of evidence supporting a model 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.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Developing and Using Models*** Developing and using models includes building and revising simple models and using models to represent events and design solutions.
* Use models to describe phenomena.
 |
| **Disciplinary Core Ideas** | **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 (e.g., by weighing or by its effects on other objects). For example, a model showing 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 (e.g., leaves in wind, dust suspended in air); and the appearance of visible scale water droplets in condensation, fog, and, by extension, also in clouds or the contrails of a jet. |
| **Crosscutting Concepts** | **Scale, Proportion, and Quantity**Natural objects exist from the very small to the immensely large. |

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

**Articulation of DCIs across grade levels:** [2.PS1.A](https://www.nextgenscience.org/2ps1-matter-interactions), [MS.PS1.A](https://www.nextgenscience.org/msps1-matter-interactions)

**Connections to English Language Arts:**

RI.MF.5.6. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, timelines, animations, or interactive elements on web pages) and explain how the information contributes to an understanding of the text in which it appears.

**Connections to Mathematics:**

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

5.M.B.3. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

5.DL.A.2. Develop strategies to collect, organize and represent data of various types and from various sources. Communicate results digitally through a data visual (e.g., chart, storyboard, video presentation). (Science example: 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.)

**Observable features of the student performance by the end of the grade:**

1. Components of the model
	1. Students develop a model to describe a phenomenon that includes the idea that matter is made of particles too small to be seen. In the model, students identify the relevant components for the phenomenon, including:
2. Bulk matter (macroscopic observable matter; e.g., as sugar, air, water).
3. Particles of matter that are too small to be seen.
4. Relationships
5. In the model, students identify and describe relevant relationships between components, including the relationships between:
6. Bulk matter and tiny particles that cannot be seen (e.g., tiny particles of matter that cannot be seen make up bulk matter).
7. The behavior of a collection of many tiny particles of matter and observable phenomena involving bulk matter (e.g., an expanding balloon, evaporating liquids, substances that dissolve in a solvent, effects of wind).
8. Connections
9. Students use the model to describe how matter composed of tiny particles too small to be seen can account for observable phenomena (e.g., air inflating a basketball, ice melting into water).

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 form new substances.) (Assessment Boundary: Assessment does not include distinguishing mass and weight. Students do not need to know structure of atoms, specific chemical equations.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Using Mathematics and Computational Thinking*** Using mathematical and computational thinking includes extending quantitative measurements to a variety of physical properties and using mathematics and computation to analyze data and compare alternative design solutions.
* Measure and graph quantities such as weight to address scientific and engineering questions and problems.
 |
| **Disciplinary Core Ideas** | **PS1.A: Structure and Properties of Matter**The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish (e.g., sugar in solution, evaporation in a closed container). **PS1.B: Chemical Reactions**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.) |
| **Crosscutting Concepts** | **Scale, Proportion, and Quantity**Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.***Connections to Nature of Science*****Scientific Knowledge Assumes an Order and Consistency in Natural Systems**Science assumes consistent patterns in natural systems |

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

**Articulation of DCIs across grade levels:** [2.PS1.A](https://www.nextgenscience.org/2ps1-matter-interactions) and [2.PS1.B](https://www.nextgenscience.org/2ps1-matter-interactions); [MS.PS1.A and](https://www.nextgenscience.org/msps1-matter-interactions) [MS.PS1.B](https://www.nextgenscience.org/msps1-matter-interactions)

**Connections to English Language Arts:**

W.WR.5.5. Establish a central idea about a topic, investigation, issue or event and use several sources to support the proposed central idea.

SL.PE.5.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly. (See A through C.)

**Connections to Mathematics:**

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

5.M.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.
(Science example: When 100 g of sugar is dissolved in 0.5 kg of water, what is the total weight of the system? Answer in grams, then answer again in kilograms. After the water evaporates, see how much the sugar residue weighs.)

5.M.C.4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units
(Science example: Compress the air in a cylinder to half its volume. (Draw a picture of the volume before and after and explain how you know that the new volume is half of the old volume.) Can you compress the volume by half again? Why is it difficult to do?) (Boundary statement: Ratios are not expected until grade 6. Scientific notation is not expected until grade 8.)

**Observable features of the student performance by the end of the grade:**

1. Representation
2. Students measure and graph the given quantities using standard units, including:
3. The weight of substances before they are heated, cooled, or mixed.
4. The weight of substances, including any new substances produced by a reaction, after they are heated, cooled, or mixed.
5. Mathematical/computational analysis
6. Students measure and/or calculate the difference between the total weight of the substances (using standard units) before and after they are heated, cooled, and/or mixed.
7. Students describe the changes in properties they observe during and/or after heating, cooling, or mixing substances.
8. Students use their measurements and calculations to describe that the total weights of the substances did not change, regardless of the reaction or changes in properties that were observed.
9. Students use measurements and descriptions of weight, as well as the assumption of consistent patterns in natural systems, to describe evidence to address scientific questions about the conservation of the amount of matter, including the idea that the total weight of matter is conserved after heating, cooling, or mixing substances.

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 density or distinguishing mass and weight.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Planning and Carrying Out Investigations** * Planning and carrying out investigations to answer questions or test solutions to problems includes investigations that control variables and provide evidence to support explanations.
* Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
 |
| **Disciplinary Core Ideas** | **PS1.A: Structure and Properties of Matter**Measurements of a variety of properties (e.g., hardness, reflectivity) can be used to identify particular materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) |
| **Crosscutting Concepts** | **Scale, Proportion, and Quantity**Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. |

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

**Articulation of DCIs across grade levels:** [2.PS1.A](https://www.nextgenscience.org/2ps1-matter-interactions); [MS.PS1.A](https://www.nextgenscience.org/msps1-matter-interactions)

**Connections to English Language Arts:**

RI.CI.5.2. Determine the central idea of an informational text and explain how it is supported by key details; summarize the text

W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources.

**Connections to Mathematics:**

MP.2. Reason abstractly and quantitatively.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

**Observable features of the student performance by the end of the grade:**

1. Identifying the phenomenon under investigation
2. From the given investigation plan, students identify the phenomenon under investigation, which includes the observable and measurable properties of materials.
3. Students identify the purpose of the investigation, which includes collecting data to serve as the basis for evidence for an explanation about the idea that materials can be identified based on their observable and measurable properties.
4. Identifying the evidence to address the purpose of the investigation
5. From the given investigation plan, students describe the evidence from data (e.g., qualitative observations and measurements) that will be collected, including:

i. Properties of materials that can be used to identify those materials (e.g., color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility).

1. Students describe how the observations and measurements will provide the data necessary to address the purpose of the investigation.
2. Planning the investigation
3. From the given plan investigation plan, students describe how the data will be collected. Examples could include:
4. Quantitative measures of properties, in standard units (e.g., grams, liters).
5. Observations of properties such as color, conductivity, and reflectivity.
6. Determination of conductors vs. nonconductors and magnetic vs. nonmagnetic materials.
7. Students describe how the observations and measurements they make will allow them to identify materials based on their properties.
8. Collecting the data
9. Students collect and record data, according to the given investigation plan.

5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
(Clarification Statement: Students are not expected to be able to balance chemical equations but should be able to complete simple mathematical (addition and subtraction) calculations in regard to starting materials and ending materials.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Planning and Carrying Out Investigations** * Planning and carrying out investigations to answer questions or test solutions to problems includes investigations that control variables and provide evidence to support explanations.
* 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.
 |
| **Disciplinary Core Ideas** | **PS1.B: Chemical Reactions**When two or more different substances are mixed, a new substance with different properties may be formed. (Boundary: Mass and weight are not distinguished at this grade level.) |
| **Crosscutting Concepts** | **Cause and Effect**Cause and effect relationships are routinely identified and used to explain change. |

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

**Articulation of DCIs across grade levels:** [2.PS1.B](https://www.nextgenscience.org/2ps1-matter-interactions); [MS.PS1.A](https://www.nextgenscience.org/msps1-matter-interactions) and [MS.PS1.B](https://www.nextgenscience.org/msps1-matter-interactions)

**Connections to English Language Arts:**

W.IW.5.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
(Clarification Statements: Informative writing informs the reader by presenting facts, details, and descriptions about a topic. Explanatory writing explains a process, idea, or concept by showing how or why something happens.)

SL.II.5.2. Summarize a written text read aloud or information presented in diverse media and formats (e.g., visually, quantitatively, and orally).

**Connections to Mathematics:** N/A

**Observable features of the student performance by the end of the grade:**

1. Identifying the phenomenon under investigation
2. From the given investigation plan, students describe the phenomenon under investigation, which includes the mixing of two or more substances.
3. Students identify the purpose of the investigation, which includes providing evidence for whether new substances are formed by mixing two or more substances, based on the properties of the resulting substance.
4. Identifying the evidence to address the purpose of the investigation
5. From the given investigation plan, students describe the evidence from data that will be collected, including:
6. Quantitative (e.g., weight) and qualitative properties (e.g., state of matter, color, texture, odor) of the substances to be mixed.
7. Quantitative and qualitative properties of the resulting substances.
8. Students describe how the collected data can serve as evidence for whether the mixing of the two or more tested substances results in one or more new substances.
9. Planning the investigation
10. From the given investigation plan, students describe how the data will be collected, including:
11. How quantitative and qualitative properties of the two or more substances to be mixed will be determined and measured.
12. How quantitative and qualitative properties of the substances that resulted from the mixture of the two or more substances will be determined and measured.
13. Number of trials for the investigation.
14. How variables will be controlled to ensure a fair test (e.g., the temperature at which the substances are mixed, the number of substances mixed together in each trial).
15. Collecting the data
16. According to the investigation plan, students collaboratively collect and record data, including data about the substances before and after mixing.

## **PS2: Motion and Stability: Forces and Interaction**

5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.
(Clarification Statement: “Down” is a relative and 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.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Engaging in Argument from Evidence** * Engaging in argument from evidence includes critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).
* Use models to describe phenomena.
 |
| **Disciplinary Core Ideas** | **PS2.B: Types of Interactions**The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center. |
| **Crosscutting Concepts** | **Cause and Effect**Cause and effect relationships are routinely identified and used to explain change. |

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

**Articulation of DCIs across grade levels:** [3.PS2.A](https://www.nextgenscience.org/3ps2-motion-stability-forces-interactions) [and](https://www.nextgenscience.org/3ps2-motion-stability-forces-interactions) [3.PS2.B](https://www.nextgenscience.org/3ps2-motion-stability-forces-interactions); [MS.PS2.B](https://www.nextgenscience.org/msps2-motion-stability-forces-interactions); [MS.ESS1.B](https://www.nextgenscience.org/msess1-earth-place-universe), [MS.ESS2.C](https://www.nextgenscience.org/msess2-earth-systems)

**Connections to English Language Arts:**

RI.CR.5.1. Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text.

RI.AA.5.7. Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).

**Connections to Mathematics:** N/A

**Observable features of the student performance by the end of the grade:**

1. Supported claims
2. Students identify a given claim to be supported about a phenomenon. The claim includes the idea that the gravitational force exerted by Earth on objects is directed down toward the center of Earth.
3. Identifying scientific evidence
4. Students identify and describe the evidence given, data, and/or models that support the claim, including:
5. Multiple lines of evidence that indicate that the Earth’s shape is spherical (e.g., observation of ships sailing beyond the horizon, the shape of the Earth’s shadow on the moon during an eclipse, the changing height of the North Star above the horizon as people travel north and south).
6. That objects dropped appear to fall straight down.
7. That people live all around the spherical Earth, and they all observe that objects appear to fall straight down.
8. Evaluation and critique
9. Students evaluate the evidence to determine whether it is sufficient and relevant to supporting the claim.
10. Students describe whether any additional evidence is needed to support the claim.
11. Reasoning and synthesis
12. Students use reasoning to connect the relevant and appropriate evidence to support the claim with argumentation. Students describe a chain of reasoning that includes:
13. If Earth is spherical, and all observers see objects near them falling directly “down” to the Earth’s surface, then all observers would agree that objects fall toward the Earth’s center.
14. Since an object that is initially stationary when held moves downward when it is released, there must be a force (gravity) acting on the object that pulls the object toward the center of Earth.

## **PS3: Energy**

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.). (Assessment Boundary: Assessment does not include photosynthesis or the photosynthesis equation.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Developing and Using Models*** Developing and using models includes building and revising simple models and using models to represent events and design solutions.
* Use models to describe phenomena.
 |
| **Disciplinary Core Ideas** | **PS3.D: Energy in Chemical Processes and Everyday Life**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). (Boundary: The fact that plants capture energy from sunlight is introduced at this grade level, but details of photosynthesis are not.)**LS1.C: Organization for Matter and Energy Flow in Organisms*** Food provides animals with the materials they need for body repair and growth and is digested to release the energy they need to maintain body warmth and for motion.
* Plants acquire their material for growth chiefly from air and water and process matter they have formed to maintain their internal conditions (e.g., at night).
 |
| **Crosscutting Concepts** | **Energy and Matter**Energy can be transferred in various ways and between objects. |

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

**Articulation of DCIs across grade levels:** [K.LS1.C](https://www.nextgenscience.org/kls1-molecules-organisms-structures-processes); [2.LS2.A](https://www.nextgenscience.org/2ls2-ecosystems-interactions-energy-dynamics); [4.PS3.A](https://www.nextgenscience.org/4ps3-energy), [4.PS3.B](https://www.nextgenscience.org/4ps3-energy), [and](https://www.nextgenscience.org/4ps3-energy) [4.PS3.D](https://www.nextgenscience.org/4ps3-energy); [MS.PS3.D](https://www.nextgenscience.org/msls1-molecules-organisms-structures-processes); [MS.PS4.B](https://www.nextgenscience.org/msps4-waves-applications-technologies-information-transfer); [MS.LS1.C](https://www.nextgenscience.org/msls1-molecules-organisms-structures-processes); [MS.LS2.B](https://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics)

**Connections to English Language Arts:**

RI.CI.5.2. Determine the central idea of an informational text and explain how it is supported by key details; summarize the text.

W.IW.5.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (See A through E)
(Clarification Statements: *Informative writing* informs the reader by presenting facts, details, and descriptions about a topic. *Explanatory writing* explains a process, idea, or concept by showing how or why something happens.)

**Connections to Mathematics:** N/A

**Observable features of the student performance by the end of the grade:**

1. Components of the model
2. Students use models to describe a phenomenon that includes the idea that energy in animals’ food was once energy from the sun. Students identify and describe the components of the model that are relevant for describing the phenomenon, including:
3. Energy.
4. The sun.
5. Animals, including their bodily functions (e.g., body repair, growth, motion, body warmth maintenance).
6. Plants.
7. Relationships
8. Students identify and describe the relevant relationships between components, including:
9. The relationship between plants and the energy they get from sunlight to produce food.
10. The relationship between food and the energy and materials that animals require for bodily functions (e.g., body repair, growth, motion, body warmth maintenance).
11. The relationship between animals and the food they eat, which is either other animals or plants (or both), to obtain energy for bodily functions and materials for growth and repair.
12. Connections
13. Students use the models to describe causal accounts of the relationships between energy from the sun and animals’ needs for energy, including that:
14. Since all food can eventually be traced back to plants, all of the energy that animals use for body repair, growth, motion, and body warmth maintenance is energy that once came from the sun.
15. Energy from the sun is transferred to animals through a chain of events that begins with plants producing food then being eaten by animals.

## **LS1: From Molecules to Organisms: Structures and Processes**

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.) (Assessment Boundary: Assessment does not include photosynthesis or the photosynthesis reaction equation. Students should know that plants carry out photosynthesis for energy, but they do not need to know the specifics of the process or equation.

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Engaging in Argument from Evidence** * Engaging in argument from evidence includes 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
 |
| **Disciplinary Core Ideas** | **LS1.C: Organization for Matter and Energy Flow in Organisms*** Animals and plants alike generally need to take in air and water, animals must take in food, and plants need light and minerals; anaerobic life, such as bacteria in the gut, functions without air.
* Food provides animals with the materials they need for body repair and growth and is digested to release the energy they need to maintain body warmth and for motion.
* Plants acquire their material for growth chiefly from air and water and process matter they have formed to maintain their internal conditions (e.g., at night).
 |
| **Crosscutting Concepts** | **Energy and Matter**Matter is transported into, out of, and within systems. |

**Connections to other DCIs in fifth grade:** [5.PS1.A](https://www.nextgenscience.org/5ps1-matter-interactions)

**Articulation of DCIs across grade levels:** [K.LS1.C](https://www.nextgenscience.org/kls1-molecules-organisms-structures-processes); [2.LS2.A](https://www.nextgenscience.org/2ls2-ecosystems-interactions-energy-dynamics); [MS.LS1.C](https://www.nextgenscience.org/msls1-molecules-organisms-structures-processes)

**Connections to English Language Arts:**

RI.CR.5.1. Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text.

W.AW.5.1. Write opinion pieces on topics or texts, supporting a point of view with reasons and information.
(Science Clarification: Students make a causal claim about a given phenomenon,. provide evidence, data, and/or models that support the claim, and use reasoning to connect the evidence to support the claim with argumentation.)

**Connections to Mathematics:**

5.M.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.
(Science example: In an experiment to rule out soil as a source of plant food, Sue weighed the soil using units of grams but Katya weighed the plant using units of kilograms. The soil lost 4 grams, while the plant gained 0.1 kilograms. Did the plant gain much more than the soil lost? Much less? About the same? (A good way to begin is to express both figures in grams.))

5.NBT.A.3. Read, write, and compare decimals to thousandths.

* 1. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., .
	2. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

5.NBT.A.4. Use place value understanding to round decimals to any place.

**Observable features of the student performance by the end of the grade:**

1. Supported claims
2. Students identify a given claim to be supported about a given phenomenon. The claim includes the idea that plants acquire the materials they need for growth chiefly from air and water.
3. Identifying scientific evidence
4. Students describe the given evidence, data, and/or models that support the claim, including evidence of:
5. Plant growth over time.
6. Changes in the weight of soil and water within a closed system with a plant, indicating:
7. Soil does not provide most of the material for plant growth (e.g., changes in weight of soil and a plant in a pot over time, hydroponic growth of plants).
8. Plants’ inability to grow without water.
9. Plants’ inability to grow without air.
10. Air is matter (e.g., empty object vs. air filled object).
11. Evaluating and critiquing evidence
12. Students determine whether the evidence supports the claim, including:
13. Whether a particular material (e.g., air, soil) is required for growth of plants.
14. Whether a particular material (e.g., air, soil) may provide sufficient matter to account for an observed increase in weight of a plant during growth.
15. Reasoning and synthesis
16. Students use reasoning to connect the evidence to support the claim with argumentation. Students describe a chain of reasoning that includes:
17. During plant growth in soil, the weight of the soil changes very little over time, whereas the weight of the plant changes a lot. Additionally, some plants can be grown without soil at all.
18. Because some plants don’t need soil to grow, and others show increases in plant matter (as measured by weight) but not accompanying decreases in soil matter, the material from soil.
19. must not enter the plant in sufficient quantities to be the chief contributor to plant growth.
20. Therefore, plants do not acquire most of the material for growth from soil.
21. A plant cannot grow without water or air. Because both air and water are matter and are transported into the plant system, they can provide the materials plants need for growth.
22. Since soil cannot account for the change in weight as a plant grows and since plants take in water and air, both of which could contribute to the increase in weight during plant growth, plant growth must come chiefly from water and air.

## **LS2: Ecosystems: Interactions, Energy, and Dynamics**

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 rearranged and incorporated 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.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Developing and Using Models*** Developing and using models includes building and revising simple models and using models to represent events and design solutions.
* Use models to describe phenomena.
 |
| **Disciplinary Core Ideas** | **LS2.A: Interdependent Relationships in Ecosystems*** 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.

**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.  |
| **Crosscutting Concepts** | **Scale, Proportion, and Quantity**Natural objects exist from the very small to the immensely large. |

**Connections to other DCIs in fifth grade:** [5.ESS2.A](https://www.nextgenscience.org/5ess2-earth-systems), [5.PS1.A](https://www.nextgenscience.org/5ps1-matter-interactions)

**Articulation of DCIs across grade levels:** [2.PS1.A](https://www.nextgenscience.org/2ps1-matter-interactions); [2.LS4.D](https://www.nextgenscience.org/2ls4-biological-evolution-unity-diversity); [4.ESS2.E](https://www.nextgenscience.org/4ess2-earth-systems); [MS.PS3.D](https://www.nextgenscience.org/dci-arrangement/ms-ls1-molecules-organisms-structures-and-processes); [MS.LS1.C](https://www.nextgenscience.org/msls1-molecules-organisms-structures-processes); [MS.LS2.A and](https://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) [MS.LS2.B](https://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics)

**Connections to English Language Arts:**

SL.UM.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.

**Connections to Mathematics:**

MP.2. Reason abstractly and quantitatively.

MP.4. Model with Mathematics

**Observable features of the student performance by the end of the grade:**

1. Components of the model
2. Students develop a model to describe a phenomenon that includes the movement of matter within an ecosystem. In the model, students identify the relevant components, including:
3. Matter
4. Plants
5. Animals
6. Decomposers, such as fungi and bacteria
7. Environment
8. Relationships
9. Students describe the relationships among components that are relevant for describing the phenomenon, including:
10. The relationships in the system between organisms that consume other organisms, including:
11. Animals that consume other animals.
12. Animals that consume plants.
13. Organisms that consume dead plants and animals.
14. The movement of matter between organisms during consumption.
15. The relationship between organisms and the exchange of matter from and back into the environment (e.g., organisms obtain matter from their environments for life processes and release waste back into the environment, decomposers break down plant and animal remains to recycle some materials back into the soil).
16. Connections
17. Students use the model to describe:
18. The cycling of matter in the system between plants, animals, decomposers, and the environment.
19. How interactions in the system of plants, animals, decomposers, and the environment allow multiple species to meet their needs.
20. That newly introduced species can affect the balance of interactions in a system (e.g., a new animal that has no predators consumes much of another organism’s food within the ecosystem).
21. That changing an aspect (e.g., organisms or environment) of the ecosystem will affect other aspects of the ecosystem.

## **ESS1: Earth's Place in the Universe**

5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other 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).)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Engaging in Argument from Evidence** * Engaging in argument from evidence includes 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.
 |
| **Disciplinary Core Ideas** | **ESS1.A: The Universe and its Stars**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. |
| **Crosscutting Concepts** | **Scale, Proportion, and Quantity**Natural objects exist from the very small to the immensely large. |

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

**Articulation of DCIs across grade levels:** [MS.ESS1.A](https://www.nextgenscience.org/msess1-earth-place-universe) and MS.ESS1.B

**Connections to English Language Arts:**

RI.CI.5.2. Determine the central idea of an informational text and explain how it is supported by key details; summarize the text.

SL.PE.5.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly. (See A through C)

**Connections to Mathematics:**

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

5.NBT.A.2. 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.
(Science example: The sun is about 1011 meters from Earth. Sirius, another star, is about 1017 meters from Earth. Write these two numbers without exponents; position the numbers one directly below the other, aligning on the 1. How many times farther away from Earth is Sirius compared to the sun?)

**Observable features of the student performance by the end of the grade:**

1. Supported claims
2. Students identify a given claim to be supported about a given phenomenon. The claim includes the idea that the apparent brightness of the sun and stars is due to their relative distances from Earth.
3. Identifying scientific evidence
4. Students describe the evidence, data, and/or models that support the claim, including:
5. The sun and other stars are natural bodies in the sky that give off their own light.
6. The apparent brightness of a variety of stars, including the sun.
7. A luminous object close to a person appears much brighter and larger than a similar object that is very far away from a person (e.g., nearby streetlights appear bigger and brighter than distant streetlights).
8. The relative distance of the sun and stars from Earth (e.g., although the sun and other stars are all far from the Earth, the stars are very much farther away; the sun is much closer to Earth than other stars).
9. Evaluating and critiquing evidence
10. Students evaluate the evidence to determine whether it is relevant to supporting the claim, and sufficient to describe the relationship between apparent size and apparent brightness of the sun and other stars and their relative distances from Earth.
11. Students determine whether additional evidence is needed to support the claim.
12. Reasoning and synthesis
13. Students use reasoning to connect the relevant and appropriate evidence to the claim with argumentation. Students describe a chain of reasoning that includes:
14. Because stars are defined as natural bodies that give off their own light, the sun is a star.
15. The sun is many times larger than Earth but appears small because it is very far away.
16. Even though the sun is very far from Earth, it is much closer than other stars.
17. Because the sun is closer to Earth than any other star, it appears much larger and brighter than any other star in the sky.
18. Because objects appear smaller and dimmer the farther they are from the viewer, other stars, although immensely large compared to the Earth, seem much smaller and dimmer because they are so far away.
19. Although stars are immensely large compared to Earth, they appear small and dim because they are so far away.
20. Similar stars vary in apparent brightness, indicating that they vary in distance from Earth.

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, Assessment does not include cause of seasons, lunar phases, or the position of the sun in the sky throughout the year. Scientific notation is not expected until grade 8)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Analyzing and Interpreting Data** * Analyzing and interpreting data includes quantitative approaches to collecting data and conducting multiple trials of qualitative observations.
* Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
 |
| **Disciplinary Core Ideas** | **ESS1.B: Earth and the Solar System*** The orbits of Earth around the sun and of 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.
* Some objects in the solar system can be seen with the naked eye. Planets in the night sky change positions and are not always visible from Earth as they orbit the sun. Stars appear in patterns called constellations, which can be used for navigation and appear to move together across the sky because of Earth’s rotation.
 |
| **Crosscutting Concepts** | **Patterns**Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. |

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

**Articulation of DCIs across grade levels:** [1.ESS1.A and](https://www.nextgenscience.org/1ess1-earth-place-universe) [1.ESS1.B](https://www.nextgenscience.org/1ess1-earth-place-universe); [3.PS2.A](https://www.nextgenscience.org/3ps2-motion-stability-forces-interactions); [MS.ESS1.A and](https://www.nextgenscience.org/msess1-earth-place-universe) [MS.ESS1.B](https://www.nextgenscience.org/msess1-earth-place-universe)

**Connections to English Language Arts:**

SL.UM.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.

**Connections to Mathematics:**

MP.2. Reason abstractly and quantitatively.

MP.4. Model with mathematics.

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.
(Science examples:

1. Over the course of a year, students compile data for the length of the day over the course of the year. What pattern is observed when the data are graphed on a coordinate plane, and how can a model of the sun and Earth explain the pattern?
2. Students are given (x, y) coordinates for the Earth at six equally spaced times during its orbit around the sun (with the sun at the origin). Students graph the points to show snapshots of Earth’s motion through space.

**Observable features of the student performance by the end of the grade:**

1. Organizing data
2. Using graphical displays (e.g., bar graphs, pictographs), students organize data pertaining to daily and seasonal changes caused by the Earth’s rotation and orbit around the sun. Students organize data that include:
3. The length and direction of shadows observed several times during one day.
4. The duration of daylight throughout the year, as determined by sunrise and sunset times.
5. Presence or absence of selected stars and/or groups of stars that are visible in the night sky at different times of the year.
6. Identifying relationships
7. Students use the organized data to find and describe relationships within the datasets, including:
8. The apparent motion of the sun from east to west results in patterns of changes in length and direction of shadows throughout a day as Earth rotates on its axis.
9. The length of the day gradually changes throughout the year as Earth orbits the sun, with longer days in the summer and shorter days in the winter.
10. Some stars and/or groups of stars (i.e., constellations) can be seen in the sky all year, while others appear only at certain times of the year.
11. Students use the organized data to find and describe relationships among the datasets, including:
12. Similarities and differences in the timing of observable changes in shadows, daylight, and the appearance of stars show that events occur at different rates (e.g., Earth rotates on its axis once a day, while its orbit around the sun takes a full year).

## **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 and does not include transpiration or explanations of mechanisms that drive the cycle.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Developing and Using Models*** Developing and using models includes building and revising simple models and using models to represent events and design solutions.
* Develop a model using an example to describe a scientific principle.
 |
| **Disciplinary Core Ideas** | **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. Rainfall helps 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. Human activities affect Earth’s systems and their interactions at its surface.**A green hand holding a plant**This disciplinary core idea is foundational to later learning about how greenhouse gases in the atmosphere absorb and retain the energy radiated from land and ocean surfaces, thereby regulating Earth’s average surface temperature and keeping it habitable.(8.ESS2.D)  |
| **Crosscutting Concepts** | **Systems and System Models**A system can be described in terms of its components and their interactions. |

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

**Articulation of DCIs across grade levels:** [2.ESS2.A](https://www.nextgenscience.org/2ess2-earth-systems); [3.ESS2.D](https://www.nextgenscience.org/3ess2-earth-systems); [4.ESS2.A](https://www.nextgenscience.org/4ess2-earth-systems); [MS.ESS2.A](https://www.nextgenscience.org/msess2-earth-systems), [MS.ESS2.C](https://www.nextgenscience.org/msess2-earth-systems), [and](https://www.nextgenscience.org/msess2-earth-systems) [MS.ESS2.D](https://www.nextgenscience.org/msess2-earth-systems)

**Connections to English Language Arts:**

RI.MF.5.6. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, timelines, animations, or interactive elements on web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.UM.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.

**Connections to Mathematics:**

MP.2. Reason abstractly and quantitatively.

MP.4 Model with mathematics.

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.
(Science example: Plot monthly data for high and low temperatures in two locations, one coastal and one inland (e.g., San Francisco County vs. Sacramento). What patterns do you see? How can the influence of the ocean be seen in the observed patterns?)

**Observable features of the student performance by the end of the grade:**

1. Components of the model
2. Students develop a model, using a specific given example of a phenomenon, to describe ways that the geosphere, biosphere, hydrosphere, and/or atmosphere interact. In their model, students identify the relevant components of their example, including features of two of the following systems that are relevant for the given example:
3. Geosphere (i.e., solid and molten rock, soil, sediment, continents, mountains).
4. Hydrosphere (i.e., water and ice in the form of rivers, lakes, glaciers).
5. Atmosphere (i.e., wind, oxygen).
6. Biosphere (i.e., plants, animals (including humans)).
7. Relationships
8. Students identify and describe relationships (interactions) within and between the parts of the Earth systems identified in the model that are relevant to the example (e.g., the atmosphere and the hydrosphere interact by exchanging water through evaporation and precipitation; the hydrosphere and atmosphere interact through air temperature changes, which lead to the formation or melting of ice).
9. Connections
10. Students use the model to describe a variety of ways in which the parts of two major Earth systems in the specific given example interact to affect the Earth’s surface materials and processes in that context. Students use the model to describe how parts of an individual Earth system:
11. Work together to affect the functioning of that Earth system.
12. Contributes to the functioning of the other relevant Earth system.

5-ESS2-2. Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
(Clarification Statement: The emphasis is on the cycling of water through a watershed through evaporation, precipitation, absorption, surface runoff, and condensation.) (Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Using Mathematics and Computational Thinking*** Using mathematical and computational thinking includes extending quantitative measurements to a variety of physical properties and using mathematics and computation to analyze data and compare alternative design solutions.
* Describe and graph quantities such as area and volume to address scientific questions.
 |
| **Disciplinary Core Ideas** | **ESS2.C: The Roles of Water in Earth’s Surface Processes**Water is found almost everywhere on Earth: as vapor; as fog or clouds in the atmosphere; as rain or snow falling from clouds; as ice, snow, and running water on land and in the ocean; and as groundwater beneath the surface. The downhill movement of water as it flows to the ocean shapes the appearance of the land. 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. |
| **Crosscutting Concepts** | **Scale, Proportion, and Quantity**Standard units are used to measure and describe physical quantities such as weight and volume. |

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

**Articulation of DCIs across grade levels:** [2.ESS2.C](https://www.nextgenscience.org/2ess2-earth-systems); [MS.ESS2.C](https://www.nextgenscience.org/msess2-earth-systems); [MS.ESS3.A](https://www.nextgenscience.org/msess3-earth-human-activity)

**Connections to English Language Arts:**

W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources.

SL.UM.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.

**Connections to Mathematics:**

MP.2. Reason abstractly and quantitatively.

MP.4. Model with mathematics.

**Observable features of the student performance by the end of the grade:**

1. Representation
2. Students graph the given data (using standard units) about the amount of salt water and the amount of fresh water in each of the following reservoirs, as well as in all the reservoirs combined, to address a scientific question:
3. Oceans
4. Lakes
5. Rivers
6. Glaciers
7. Ground water
8. Polar ice caps
9. Mathematical/computational analysis
10. Students use the graphs of the relative amounts of total salt water and total fresh water in each of the reservoirs to describe that:
11. The majority of water on Earth is found in the oceans.
12. Most of the Earth’s fresh water is stored in glaciers or underground.
13. A small fraction of fresh water is found in lakes, rivers, wetlands, and the atmosphere.

ESS3: Earth and Human Activity

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.
(Clarification Statement: Examples of changed practices or processes include treating sewage, reducing the amounts of materials used, capturing polluting emissions from factories or power plants, and preventing runoff from agricultural activities.) (Assessment Boundary: Assessment does not include the science of climate change or social science aspects of practices such as regulation or policy.)

| **Dimension** | **Descriptions of the Developmentally Appropriate Elements** |
| --- | --- |
| **Science and Engineering Practices** | **Obtaining, Evaluating, and Communicating Information*** Obtaining, evaluating, and communicating information includes 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.
 |
| **Disciplinary Core Ideas** | **ESS3.C: Human Impacts on Earth Systems*** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
* Individuals and communities are doing things to help protect Earth’s resources and environments. For example, they are treating sewage, reducing the amounts of materials they use, and regulating sources of pollution such as emissions from factories and power plants or the runoff from agricultural activities.

A green hand holding a plantThese disciplinary core ideas are foundational to later learning that the sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources (HS.ESS3.C). |
| **Crosscutting Concepts** | **Systems and System Models**A system can be described in terms of its components and their interactions. |

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

**Articulation of DCIs across grade levels:** [MS.ESS3.A](https://www.nextgenscience.org/msess3-earth-human-activity), [MS.ESS3.C, and](https://www.nextgenscience.org/msess3-earth-human-activity) [MS.ESS3.D](https://www.nextgenscience.org/msess3-earth-human-activity)

**Connections to English Language Arts:**

W.SE.5.6. Gather relevant information from multiple valid and reliable print and digital sources; summarize or paraphrase information in notes and finished work, making note of any similarities and differences among ideas presented; and provide a list of sources.

RI.CR.5.2 Quote accurately from an informational text when explaining what the text says explicitly and make relevant connections when drawing inferences from the text.

RI.CT.5.8. Compare and contrast the authors’ approaches across two or more informational texts within the same genre or about texts on the same or similar topics.

**Connections to Mathematics:**

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

**Observable features of the student performance by the end of the grade:**

1. Obtaining information
2. Students obtain information from books and other reliable media about:
3. How a given human activity (e.g., in agriculture, industry, everyday life) affects the Earth’s resources and environments.
4. How a given community uses scientific ideas to protect a given natural resource and the environment in which the resource is found.
5. Evaluating information
6. Students combine information from two or more sources to provide and describe evidence about:
7. The positive and negative effects on the environment as a result of human activities.
8. How individual communities can use scientific ideas and a scientific understanding of interactions between components of environmental systems to protect a natural resource and the environment in which the resource is found.