

FIRST GRADE

The performance expectations in first grade help students formulate answers to questions such as: “What happens when materials vibrate? What happens when there is no light? What are some ways plants and animals meet their needs so that they can survive and grow? How are parents and their children similar and different? What objects are in the sky and how do they seem to move?” First grade performance expectations include PS4, LS1, LS3, and ESS1

Disciplinary Core Ideas from the NRC Framework. Students are expected to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light. Students are also expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students are able to observe, describe, and predict some patterns of the movement of objects in the sky.

The crosscutting concepts of patterns; cause and effect; structure and function; 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 first grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

1. Waves: Light and Sound

Students who demonstrate understanding can:

1-PS4-1

Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

[Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string.

Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork or a person making a hunting call.]

1-PS4-2

Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.

[Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

1-PS4-3

Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

[Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]

1-PS4-4

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

[Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones,” and a pattern of drum beats. Explain how the device works.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]

1-PS4-1

Students who demonstrate understanding can: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork or a person making a hunting call.

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

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|--|--|---|
| <p>Planning and Carrying Out Investigations</p> <ul style="list-style-type: none">Plan and conduct investigations collaboratively to produce evidence to answer a question. <p>Connections to Nature of Science</p> <p>Scientific Investigations Use a Variety of Methods</p> <ul style="list-style-type: none">Science investigations begin with a question.Scientists use different ways to study the world. | <p>PS4.A: Wave Properties</p> <ul style="list-style-type: none">Sound can make matter vibrate, and vibrating matter can make sound. | <p>Cause and Effect</p> <ul style="list-style-type: none">Simple tests can be designed to gather evidence to support or refute student ideas about causes. |

1-PS4-2

Students who demonstrate understanding can: Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.

Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

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

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|--|---|--|
| Constructing Explanations and Designing Solutions <ul style="list-style-type: none">• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. | PS4.B: Electromagnetic Radiation <ul style="list-style-type: none">• Objects can be seen if light is available to illuminate them or if they give off their own light. | Cause and Effect <ul style="list-style-type: none">• Simple tests can be designed to gather evidence to support or refute student ideas about causes. |

1-PS4-3

Students who demonstrate understanding can: Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).

Assessment Boundary: Assessment does not include the speed of light.

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

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|--|--|
| Planning and Carrying Out Investigations <ul style="list-style-type: none">Plan and conduct investigations collaboratively to produce evidence to answer a question. | PS4.B: Electromagnetic Radiation <ul style="list-style-type: none">Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) | Cause and Effect <ul style="list-style-type: none">Simple tests can be designed to gather evidence to support or refute student ideas about causes. |

1-PS4-4

Students who demonstrate understanding can: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones,” and a pattern of drum beats. Explain how the device works.

Assessment Boundary: Assessment does not include technological details for how communication devices work.

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

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|--|--|---|
| Constructing Explanations and Designing Solutions <ul style="list-style-type: none">Use tools and materials provided to design a device that solves a specific problem. | PS4.C: Information Technologies and Instrumentation <ul style="list-style-type: none">People also use a variety of devices to communicate (send and receive information) over long distances. | Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science, on Society and the Natural World <ul style="list-style-type: none">People depend on various technologies in their lives; human life would be very different without technology. |

1. Structure, Function, and Information Processing

Students who demonstrate understanding can:

1-LS1-1

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.* [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells (e.g., protective helmets), acorn shells, mollusks, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; detecting intruders by mimicking eyes and ears; use of camouflage, or tools such as snowshoes. Explain how the solution solves the problem described.]

1-LS1-2

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

1-LS3-1

Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]

1-LS1-1

Students who demonstrate understanding can: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*

Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells (e.g., protective helmets), acorn shells, mollusks, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; detecting intruders by mimicking eyes and ears; use of camouflage, or tools such as snowshoes. Explain how the solution solves the problem described.

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

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|--|--|--|
| <p>Constructing Explanations and Designing Solutions</p> <ul style="list-style-type: none"> Use materials to design a device that solves a specific problem or a solution to a specific problem. | <p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. <p>LS1.D: Information Processing</p> <ul style="list-style-type: none"> Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. | <p>Structure and Function</p> <ul style="list-style-type: none"> The shape and stability of structures of natural and designed objects are related to their function(s). <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Science, Engineering and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. |

1-LS1-2

Students who demonstrate understanding can: Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).

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| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|--|--|--|
| <p>Obtaining, Evaluating, and Communicating Information</p> <ul style="list-style-type: none">Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. <p>Connections to Nature of Science</p> <p>Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none">Scientists look for patterns and order when making observations about the world. | <p>LS1.B: Growth and Development of Organisms</p> <ul style="list-style-type: none">Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. | <p>Patterns</p> <ul style="list-style-type: none">Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. |

1-LS3-1

Students who demonstrate understanding can: Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.

Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.

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

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|--|---|---|
| Constructing Explanations and Designing Solutions <ul style="list-style-type: none">• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. | LS3.A: Inheritance of Traits <ul style="list-style-type: none">• Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. LS3.B: Variation of Traits <ul style="list-style-type: none">• Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. | Patterns <ul style="list-style-type: none">• Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. |

1. Space Systems: Patterns and Cycles

Students who demonstrate understanding can:

1-ESS1-1

Use observations of the sun, moon, stars, and tides to describe patterns that can be predicted. [Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day. Students not required to know the mechanisms that control tides.]

1-ESS1-2

Make and graph observations at different times of year to relate the amount of daylight to the time of year, and graph findings. [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]

1-ESS1-1

Students who demonstrate understanding can: Use observations of the sun, moon, stars, and tides to describe patterns that can be predicted.

Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.

Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day. Students not required to know the mechanisms that control tides.

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| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|--|
| <p>Analyzing and Interpreting Data</p> <ul style="list-style-type: none"> Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. | <p>ESS1.A: The Universe and its Stars</p> <ul style="list-style-type: none"> Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. | <p>Patterns</p> <ul style="list-style-type: none"> Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. <p>Connections to Nature of Science</p> <p>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</p> <ul style="list-style-type: none"> Science assumes natural events happen today as they happened in the past. Many events are repeated. |

1-ESS1-2

Students who demonstrate understanding can: Make and graph observations at different times of year to relate the amount of daylight to the time of year, and graph findings.

Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.

Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.

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

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|--|--|
| Planning and Carrying Out Investigations <ul style="list-style-type: none">• Make observations (firsthand or from media) to collect data that can be used to make comparisons. | ESS1.B: Earth and the Solar System <ul style="list-style-type: none">• Seasonal patterns of sunrise and sunset can be observed, described, and predicted. | Patterns <ul style="list-style-type: none">• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. |