WAVES AND THEIR APPLICATIONS

Performance Expectation	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 or plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound or holding an object near a vibrating tuning fork.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. **Planning and carrying out investigations:** Planning and carrying out investigations to answer questions (science) or test solutions (engineering) to problems in K-2 build on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**WAVE PROPERTIES** Sound can make matter vibrate, and vibrating matter can make sound. (LE.PS4A.a)	**CAUSE AND EFFECT** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

WAVES AND THEIR APPLICATIONS

Performance Expectation	Make observations to construct an evidence-based account that objects can be seen only when illuminated.
Clarification Statement	Examples of observations could include those made in a completely dark room, a pinhole box, or 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. This can be explored with light tables, 3-way mirrors, overhead projectors or flashlights.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 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 and designing solutions:** Constructing explanations (science) and designing solutions (engineering) in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**ELECTROMAGNETIC RADIATION** Objects can be seen if light is available to illuminate them or if they give off their own light. Some objects give off their own light. (LE.PS4B.a)	**CAUSE AND EFFECT** Events have causes that generate observable patterns.

WAVES AND THEIR APPLICATIONS

Performance Expectation	Plan and conduct an investigation 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), or reflective (such as a mirror).

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models **3. Planning and carrying out investigations:** Planning and carrying out investigations to answer questions (science) or test solutions (engineering) to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**ELECTROMAGNETIC RADIATION** 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. (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.) (LE.PS4B.b)	**CAUSE AND EFFECT** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

WAVES AND THEIR APPLICATIONS

Performance Expectation	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," or a pattern of drumbeats.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 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 and designing solutions:** Constructing explanations (science) and designing solutions (engineering) in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**INFORMATION TECHNOLOGIES AND INSTRUMENTATION** People also use a variety of devices to communicate (send and receive information) over long distances. (LE.PS4C.a) **DEVELOPING POSSIBLE SOLUTIONS** A situation that people want to change or create can be approached as a problem to be solved through engineering. (LE.ETS1A.a)	**SYSTEMS AND SYSTEM MODELS** Systems in the natural and designed world have parts that work together.

FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

Performance Expectation	Use tools and 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, acorn shells or animal scales; stabilizing structures by mimicking animal tails or roots on plants; keeping out intruders by mimicking thorns on branches or animal quills; and detecting intruders by mimicking eyes or ears.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 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 and designing solutions:** Constructing explanations (science) and designing solutions (engineering) in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**STRUCTURE AND FUNCTION** 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. (LE.LS1A.a) **INFORMATION PROCESSING** 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. (LE.LS1D.a) **DEVELOPING POSSIBLE SOLUTIONS** Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for solutions to a problem. (LE.ETS1B.a) **OPTIMIZING THE DESIGN SOLUTION** Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (LE.ETS1C.a)	**STRUCTURE AND FUNCTION** The shape and stability of structures of natural and designed objects are related to their function(s).

FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

Performance Expectation	Read grade-appropriate 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).

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 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 and designing solutions 7. Engaging in argument from evidence 8. **Obtaining, evaluating, and communicating information:** Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).	**GROWTH AND DEVELOPMENT OF ORGANISMS** Adult plants and animals can have offspring. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (LE.LS1B.a)	**PATTERNS** Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

HEREDITY: INHERITANCE AND VARIATION OF TRAITS

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

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 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 and designing solutions:** Constructing explanations (science) and designing solutions (engineering) in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations to construct an evidence-based account for natural phenomena. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**INHERITANCE OF TRAITS** Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly like, their parents. (LE.LS3A.a) **VARIATION OF TRAITS** Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (LE.LS3B.a)	**PATTERNS** Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

EARTH'S PLACE IN THE UNIVERSE

Performance Expectation	Use observations of the sun, moon, and stars 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.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations **4. Analyzing and interpreting data:** Analyzing and interpreting data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Use observations to describe patterns in the natural world in order to answer scientific questions. 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**THE UNIVERSE AND ITS STARS** Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (LE.ESS1A.a)	**PATTERNS** Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

EARTH'S PLACE IN THE UNIVERSE

Performance Expectation	Make observations at different times of year to relate the amount of daylight to the time of year.
Clarification Statement	Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring, fall, or summer.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models **3. Planning and carrying out investigations:** Planning and carrying out investigations to answer questions or test solutions to problems in K-2 build on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Make observations to collect data that can be used to make comparisons. 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**EARTH AND THE SOLAR SYSTEM** Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (LE.ESS1B.a)	**PATTERNS** Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.