Louisiana Student Standards for Science

The Louisiana Student Standards for Science were created by over eighty content experts and educators with input from parents and teachers from across the state. Educators envisioned what students should know and be able to do to compete in our communities and created standards that would allow students to do so. The Louisiana Student Standards for Science provide appropriate content for all grades or courses, maintain high expectations and create a logical connection of content across and within grades.

The Louisiana Student Standards for Science represent the knowledge and skills needed for students to successfully transition to postsecondary educations and the workplace. The standards call for students to:

- Apply content knowledge to real world phenomena and to design solutions
- Demonstrate the practices of scientists and engineers
- Connect scientific learning to all disciplines of science
- Express ideas grounded in scientific evidence

The Louisiana Student Standards do not dictate curriculum or teaching methods. Decisions about how to teach these expectations are left to local districts, schools, and teachers.

Structure and Components of the Standards

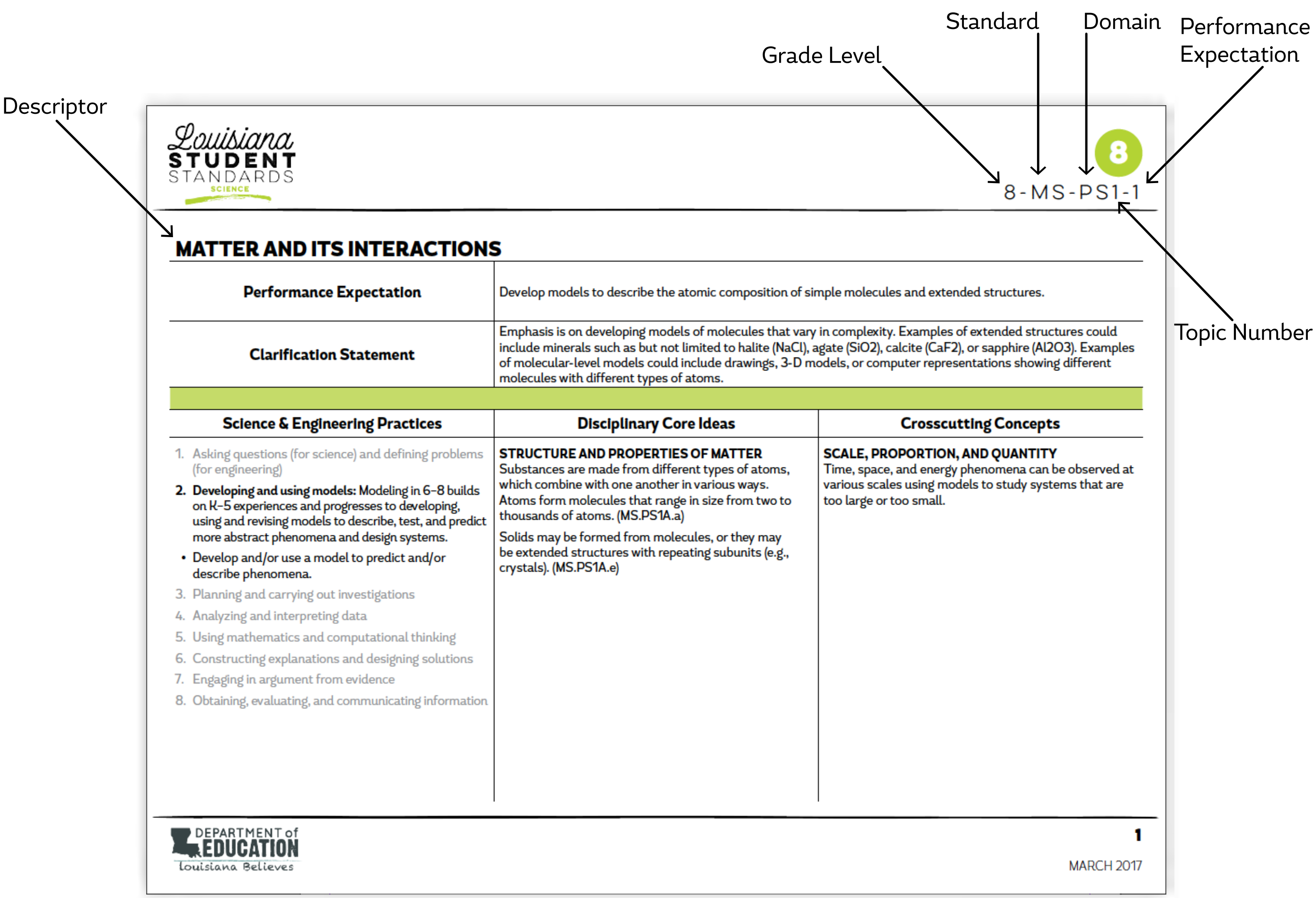
The Louisiana Student Standards for Science are arranged by grade levels for kindergarten through grade 8 and content areas for high school. The standards include:

- **Performance expectations** define what students should be able to do by the end of the year.
- **Science and engineering practices** are the practices that scientists and engineers use when investigating real world phenomena and designing solutions to problems. There are eight science and engineering practices that apply to all grade levels and content areas.
    1. Asking questions (science) and defining problems (engineering)
    2. Developing and using models
    3. Planning and carrying out investigations
    4. Analyzing and interpreting data
    5. Using mathematical and computational thinking
    6. Constructing explanations (science) and designing solutions (engineering)
    7. Engaging in argument with evidence
    8. Obtaining, evaluating, and communicating information
- **Disciplinary Core Ideas** describe the most essential ideas (content) in the major science disciplines that students will learn. Disciplinary Core Ideas are grouped into five science domains.
    1. Physical Science (PS)
    2. Life Science (LS)
    3. Earth and Space Science (ESS)
    4. Environmental Science (EVS)
    5. Engineering, Technology, and Applications of Science (ETS)
- **Crosscutting Concepts** are common themes that have application across all disciplines of science and allow students to connect learning within and across grade levels or content areas. The seven crosscutting concepts apply to all grade levels and content areas.
    1. Patterns
    2. Cause and effect
    3. Scale, proportion, and quantity
    4. Systems and models
    5. Energy and matter
    6. Structure and function
    7. Stability and change
- **Clarification statements** provide examples or additional explanation to the performance expectation.

Interpreting Standard Codes

Each performance expectation is identified by a code and descriptor. The coding is derived by the following formula: Grade level-Domain and Topic Number- Performance Expectation Number (space)

3-PS2-1 **Motion and Stability: Forces and Interactions**	The grade level is 3, the domain is Physical Science, the topic number is 2, and the performance expectation number is 1. The descriptor is, "Motion and Stability: Forces and Interactions."
7-MS-ESS2-4 **Earth's Systems**	The grade level is 7, the standard is middle school, the domain is Earth and Space Science, the topic number is 2, and the performance expectation is 1. The descriptor is, "Earth's Systems."
HS-LS1-1 **From Molecules to Organisms: Structures and Processes**	The standard is high school, the domain is Life Science, the topic number is 1, and the performance expectation number is 1. The descriptor is, "From Molecules to Organisms: Structures and Processes."



MOTION AND STABILITY: FORCES AND INTERACTIONS

Performance Expectation	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
Clarification Statement	Examples could include an unbalanced force on one side of an object that can make it start moving, or balanced forces pushing on an object from opposite sides will not produce any motion at all. Investigations include one variable at a time: number, size, or direction of forces.

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 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and 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. 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	**FORCES AND MOTION** Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it but they add to give zero net force on the object. (UE.PS2A.a) Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (UE.PS2A.b) **TYPES OF INTERACTIONS** Objects in contact exert forces on each other. (UE.PS2B.a)	**CAUSE AND EFFECT** Cause and effect relationships are routinely identified, tested, and used to explain change.

MOTION AND STABILITY: FORCES AND INTERACTIONS

Performance Expectation	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
Clarification Statement	Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, or two children on a see-saw.

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 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. 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	**FORCES AND MOTION** The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (UE.PS2A.c)	**PATTERNS** Patterns of change can be used to make predictions.

MOTION AND STABILITY: FORCES AND INTERACTIONS

Performance Expectation	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
Clarification Statement	Examples of an electric force could include the force on hair from an electrically charged balloon or the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paper clips, or the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects the strength of the force or how the orientation of magnets affects the direction of the magnetic force. Examples could include forces produced by objects that can be manipulated by students, or electrical interactions could include static electricity.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. **Asking questions and defining problems:** Asking questions (science) and defining problems (engineering) in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**TYPES OF INTERACTIONS** Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (UE.PS2B.b)	**CAUSE AND EFFECT** Cause and effect relationships are routinely identified, tested, and used to explain change.

MOTION AND STABILITY: FORCES AND INTERACTIONS

Performance Expectation	Define a simple design problem that can be solved by applying scientific ideas about magnets.
Clarification Statement	Examples of problems could include constructing a latch to keep a door shut or creating a device to keep two moving objects from touching each other.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. **Asking questions and defining problems:** Asking questions (science) and defining problems (engineering) in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**TYPES OF INTERACTIONS** Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, their orientation relative to each other. (UE.PS2B.b) **DEFINING AND DELIMITING ENGINEERING PROBLEMS** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (UE.ETS1A.a)	**PATTERNS** Patterns can be used as evidence to support an explanation.

FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

Performance Expectation	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
Clarification Statement	Changes that organisms go through during their lives form a pattern. For plant life cycles there is an emphasis on flowering plants.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. **Developing and using models:** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop and/or use models to describe and/or predict phenomena. 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	**GROWTH AND DEVELOPMENT OF ORGANISMS** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (UE.LS1B.a)	**PATTERNS** Patterns of change can be used to make predictions.

ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

Performance Expectation	Construct and support an argument that some animals form groups that help members survive.
Clarification Statement	Arguments could include examples of group behavior such as division of labor in a bee colony, flocks of birds staying together to confuse or intimidate predators, or wolves hunting in packs to more efficiently catch and kill prey.

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:** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Construct and/or support an argument with evidence, data, and/or a model. 8. Obtaining, evaluating, and communicating information	**SOCIAL INTERACTIONS AND GROUP BEHAVIOR** Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (UE.LS2D.a)	**SYSTEMS AND SYSTEM MODELS** A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.

HEREDITY: INHERITANCE AND VARIATION OF TRAITS

Performance Expectation	Analyze and interpret data to provide evidence that plants and animals have traits inherited from their parents and that variation of these traits exists in a group of similar organisms.
Clarification Statement	Emphasis is on organisms other than humans and does not include genetic mechanisms of inheritance and prediction of traits. Data can include drawings, photographs, measurements, or written observations. Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings.

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 data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**INHERITANCE OF TRAITS** Many characteristics of organisms are inherited from their parents. (UE.LS3A.a) **VARIATION OF TRAITS** Different organisms vary in how they look and function because they have different inherited information. (UE.LS3B.a)	**PATTERNS** Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.

HEREDITY: INHERITANCE AND VARIATION OF TRAITS

Performance Expectation	Use evidence to support the explanation that traits can be influenced by the environment.
Clarification Statement	Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted or an animal that is given too much food and little exercise may become overweight.

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 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**INHERITANCE OF TRAITS** Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (UE.LS3A.b) **VARIATION OF TRAITS** The environment also affects the traits that an organism expresses. (UE.LS3B.b)	**CAUSE AND EFFECT** Cause and effect relationships are routinely identified, tested, and used to explain change.

BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

Performance Expectation	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
Clarification Statement	Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include major fossil types such as marine fossils found on dry land, tropical plant fossils found in arctic areas, or fossils of extinct organisms and relative ages.

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 data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**EVIDENCE OF COMMON ANCESTRY AND DIVERSITY** Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (UE.LS4A.a) Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environment. (UE.LS4A.b)	**SCALE, PROPORTION, AND QUANTITY** Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.

BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

Performance Expectation	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
Clarification Statement	Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten or animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave 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:** Constructing explanations (science) and designing solutions (engineering) in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**NATURAL SELECTION** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (UE.LS4B.a)	**CAUSE AND EFFECT** Cause and effect relationships are routinely identified, tested, and used to explain change.

BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

Performance Expectation	Construct and support an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
Clarification Statement	Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitats make up a system in which the parts depend on each other.

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:** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Construct and/or support an argument with evidence, data, and/or a model. 8. Obtaining, evaluating, and communicating information	**ADAPTATION** For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (UE.LS4C.a)	**CAUSE AND EFFECT** Cause and effect relationships are routinely identified, tested, and used to explain change.

BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

Performance Expectation	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
Clarification Statement	Examples of environmental change(s) could include changes in land characteristics, water distribution, temperature, food, and other biological communities. Louisiana specific examples could include impacts related to levees, dams, crop rotations, irrigation systems, hunting limits, diversion canals, or sea level rise.

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:** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of a problem. 8. Obtaining, evaluating, and communicating information	**ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE** When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (UE.LS2C.a) **BIODIVERSITY AND HUMANS** Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (UE.LS4D.a) **DEVELOPING POSSIBLE SOLUTIONS** At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (ETS.UE.1B.b)	**SYSTEMS AND SYSTEM MODELS** A system can be described in terms of its components and their interactions.

EARTH'S SYSTEMS

Performance Expectation	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
Clarification Statement	Examples of data could include average temperature, precipitation, and wind direction. Examples of data representations could include pictographs and bar graphs.

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 data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**WEATHER AND CLIMATE** Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (UE.ESS2D.a)	**PATTERNS** Patterns of change can be used to make predictions.

EARTH'S SYSTEMS

Performance Expectation	Obtain and combine information to describe climates in different regions around the world.
Clarification Statement	Information could include rainfall and temperature data.

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 3–5 builds on K–2 experiences and progresses to 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.	**WEATHER AND CLIMATE** Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (UE.ESS2D.b)	**PATTERNS** Patterns of change can be used to make predictions.

EARTH AND HUMAN ACTIVITY

Performance Expectation	Make a claim about the merit of a design solution that reduces the impact of a weather-related hazard.
Clarification Statement	Examples of design solutions to weather-related hazards could include barriers to prevent flooding (including levees), wind-resistant roofs, tornado shelters and lightning rods.

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:** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem 8. Obtaining, evaluating, and communicating information	**NATURAL HAZARDS** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (UE.ESS3B.a) **DEVELOPING POSSIBLE SOLUTIONS** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (ETS.UE.1B.a)	**CAUSE AND EFFECT** Cause and effect relationships are routinely identified, tested, and used to explain change.