
# ARKANSAS

## K-12 SCIENCE STANDARDS

EDUCATION FOR A NEW GENERATION

# Kindergarten

# 2015

**Realigned Fall 2016 to the Arkansas Mathematics Standards and Arkansas English Language Arts Standards**

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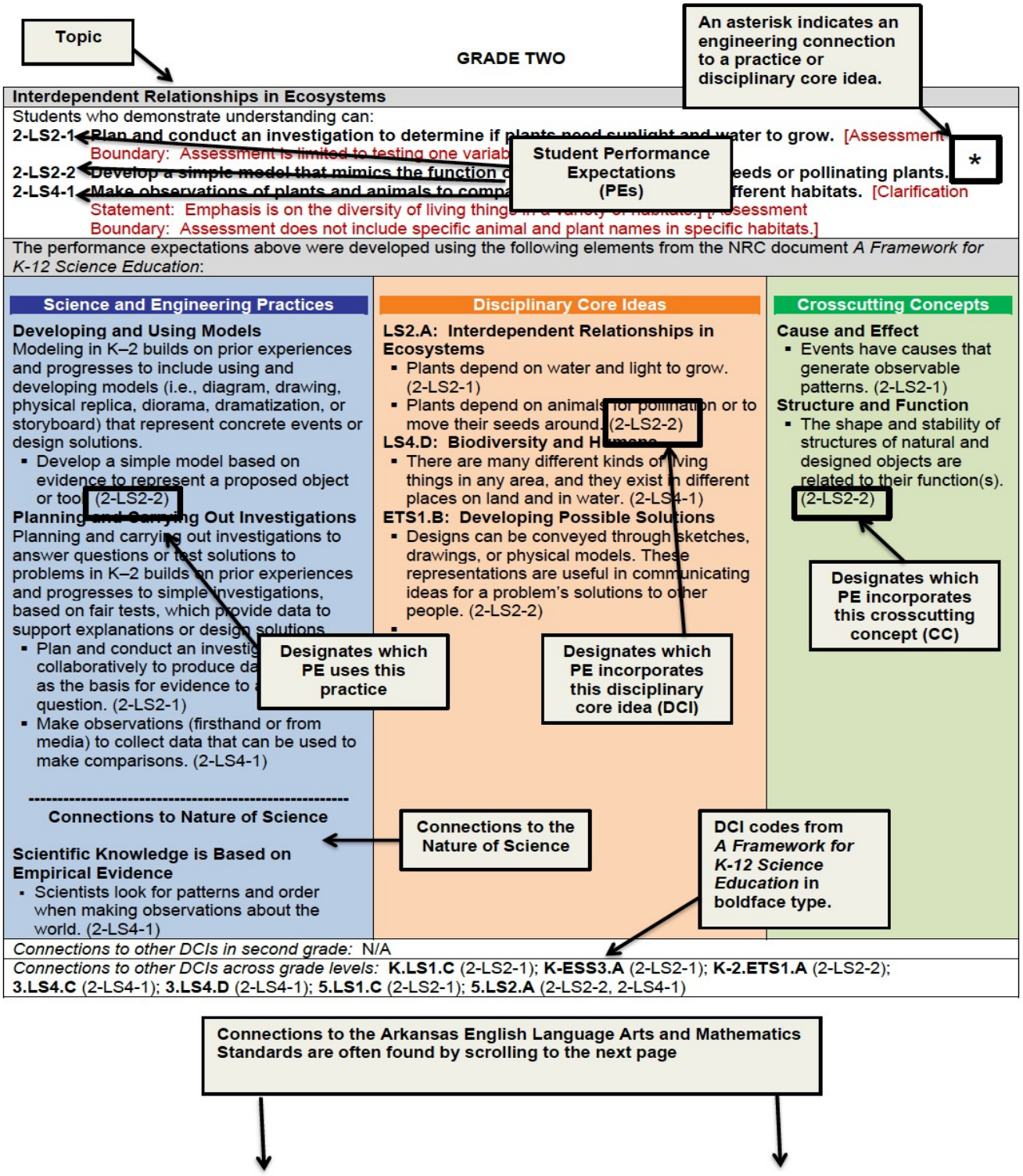
# How to Read
# Arkansas K-12 Science Standards



## Arkansas K-12 Science Standards Overview

The Arkansas K-12 Science Standards are based on *A Framework for K-12 Science Education* (NRC 2012) and are meant to reflect a new vision for science education. The following conceptual shifts reflect what is new about these science standards. The Arkansas K-12 Science Standards

- reflect science as it is practiced and experienced in the real world,
- build logically from Kindergarten through Grade 12,
- focus on deeper understanding as well as application of content,
- integrate practices, crosscutting concepts, and core ideas, and
- make explicit connections to literacy and math.

As part of teaching the Arkansas K-12 Science Standards, it will be important to instruct and guide students in adopting appropriate safety precautions for their student-directed science investigations. Reducing risk and preventing accidents in science classrooms begin with planning. The following four steps are recommended in carrying out a hazard and risk assessment for any planned lab investigation:

1) Identify all hazards. Hazards may be physical, chemical, health, or environmental.
2) Evaluate the type of risk associated with each hazard.
3) Write the procedure and all necessary safety precautions in such a way as to eliminate or reduce the risk associated with each hazard.
4) Prepare for any emergency that might arise in spite of all of the required safety precautions.

According to Arkansas Code Annotated § 6-10-113 (2012) for eye protection, every student and teacher in public schools participating in any chemical or combined chemical-physical laboratories involving caustic or explosive chemicals or hot liquids or solids is required to wear industrial-quality eye protective devices (eye goggles) at all times while participating in science investigations.

The Arkansas K-12 Science Standards outline the knowledge and science and engineering practices that all students should learn by the end of high school. The standards are three-dimensional because each student performance expectation engages students at the nexus of the following three dimensions:

- Dimension 1 describes scientific and engineering practices.
- Dimension 2 describes crosscutting concepts, overarching science concepts that apply across science disciplines.
- Dimension 3 describes core ideas in the science disciplines.

### Science and Engineering Practices

The eight practices describe what scientists use to investigate and build models and theories of the world around them or that engineers use as they build and design systems. The practices are essential for all students to learn and are as follows:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

### Crosscutting Concepts

The seven crosscutting concepts bridge disciplinary boundaries and unit core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas, and develop a coherent, and scientifically based view of the world. The seven crosscutting concepts are as follows:

1. *Patterns*- Observed patterns of forms and events guide organization and classification, and prompt questions about relationships and the factors that influence them.

2. *Cause and effect- Mechanism and explanation*. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms

by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
3. *Scale, proportion, and quantity*- In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.
4. *Systems and system models*- Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
5. *Energy and matter: Flows, cycles, and conservation*- Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.
6. *Structure and function*- The way in which an object or living thing is shaped and its substructure determines many of its properties and functions.
7. *Stability and change*- For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

## Disciplinary Core Ideas

The disciplinary core ideas describe the content that occurs at each grade or course. The Arkansas K-12 Science Standards focus on a limited number of core ideas in science and engineering both within and across the disciplines and are built on the notion of learning as a developmental progression. The Disciplinary Core Ideas are grouped into the following domains:

- Physical Science (PS)
- Life Science (LS)
- Earth and Space Science (ESS)
- Engineering, Technology and Applications of Science (ETS)

## Connections to the Arkansas English Language Arts Standards

Evidence-based reasoning is the foundation of good scientific practice. The Arkansas K-12 Science Standards incorporate reasoning skills used in language arts to help students improve mastery and understanding in all three disciplines. The Arkansas K-8 Science Committee made every effort to align grade-by-grade with the English language arts (ELA) standards so concepts support what students are learning in their entire curriculum. Connections to specific ELA standards are listed for each student performance expectation, giving teachers a blueprint for building comprehensive cross-disciplinary lessons.
The intersections between Arkansas K-12 Science Standards and Arkansas ELA Standards teach students to analyze data, model concepts, and strategically use tools through productive talk and shared activity. Reading in science requires an appreciation of the norms and conventions of the discipline of science, including understanding the nature of evidence used, an attention to precision and detail, and the capacity to make and assess intricate arguments, synthesize complex information, and follow detailed procedures and accounts of events and concepts. These practice-based standards help teachers foster a classroom culture where students think and reason together, connecting around the subject matter and core ideas.

## Connections to the Arkansas Mathematics Standards

Science is a quantitative discipline, so it is important for educators to ensure that students' science learning coheres well with their understanding of mathematics. To achieve this alignment, the Arkansas K-12 Science Committee made every effort to ensure that the mathematics standards do not outpace or misalign to the grade-by-grade science standards. Connections to specific math standards are listed for each student performance expectation, giving teachers a blueprint for building comprehensive cross-disciplinary lessons.

Table below lists key topics relevant to science and the grades at which topics are first expected in the Arkansas Mathematics Standards.

| Number and Operations | Grade First Expected |
|---|---|
| Multiplication and division of whole numbers | 3 |
| Concept of a fraction a/b | 3 |
| Beginning fraction arithmetic | 4 |
| **Measurement** | **Grade First Expected** |
| Standard length units (inch, centimeter, etc.) | 2 |
| Area | 3 |
| Convert from a larger unit to a smaller in the same system | 4 |

## Grades K-4 Science Core Ideas and Topics

| | | | |
|---|---|---|---|
| **Kindergarten** | PHYSICAL SCIENCES | LIFE SCIENCES | EARTH and SPACE SCIENCES |
| | K. Forces and Interactions: Pushes and Pulls | K. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment | K. Weather and Climate |
| | | | |
| **Grade 1** | PHYSICAL SCIENCES | LIFE SCIENCES | EARTH and SPACE SCIENCES |
| | 1. Waves: Light and Sound | 1.Structure, Function, and Information Processing | 1.Space Systems: Patterns and Cycles |
| | | | |
| **Grade 2** | PHYSICAL SCIENCES | LIFE SCIENCES | EARTH and SPACE SCIENCES |
| | 2.Structure and Properties of Matter | 2.Interdependent Relationships in Ecosystems | 2.Earth's Systems: Processes that Shape the Earth |
| ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE<br>K-2. Engineering Design | | | |

| | | | | |
|---|---|---|---|---|
| **Grade 3** | PHYSICAL SCIENCES | LIFE SCIENCES | | EARTH and SPACE SCIENCES |
| | 3.Forces and Interactions | 3.Interdependent Relationships in Ecosystems | 3.Inheritance and Variation of Traits | 3.Weather and Climate |
| | | | | |
| **Grade 4** | PHYSICAL SCIENCES | LIFE SCIENCES | | EARTH and SPACE SCIENCES |
| | 4.Waves | 4.Structure, Function, and Information Processing | | 4.Energy / 4.Earth's Systems: Processes that Shape the Earth |
| ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE<br>3-4. Engineering Design | | | | |

## Science K-4

The Arkansas K-12 Science Standards for Grades K-4 is a curriculum framework of grade level student performance expectations based on the core ideas of the physical sciences (PS), life sciences (LS), earth and space sciences (ESS), and engineering (ETS) from *A Framework for K-12 Science Education* (NRC 2012). The performance expectations build logically from Grades K-4 to Grades 5-8. The performance expectations clarify what students need to know and be able to do at the end of each grade. Student performance expectations consist of three dimensions: science and engineering practices, disciplinary core ideas, and crosscutting concepts. Engineering performance expectations are meant to be integrated into science instruction to support the learning of science phenomena at all levels from Kindergarten to Grade 12.

As part of teaching the Arkansas K-12 Science Standards, it will be important to instruct and guide students in adopting appropriate safety precautions for their student-directed science investigations. Reducing risk and preventing accidents in science classrooms begin with planning. There are four recommended steps in carrying out a hazard and risk assessment for any planned lab investigation.

1) Identify all hazards. Hazards may be physical, chemical, health, or environmental.
2) Evaluate the type of risk associated with each hazard.
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Notes:

1. Student Performance Expectations (PEs) may be taught in any sequence or grouping within a grade level.
2. An asterisk (*) indicates an engineering connection to a practice, core idea, or crosscutting concept.
3. The Clarification Statements are examples and additional guidance for the instructor. **AR** indicates Arkansas-specific Clarification Statements.
4. The Assessment Boundaries delineate content that may be taught but not assessed in large-scale assessments. **AR** indicates Arkansas-specific Assessment Boundaries.
5. The examples given (e.g.,) are suggestions for the instructor.
6. Throughout this document, connections are provided to the nature of science as defined by *A Framework for K-12 Science Education* (NRC 2012).
7. Throughout this document, connections are provided to Engineering, Technology, and Applications of Science as defined by *A Framework for K-12 Science Education* (NRC 2012).
8. Each set of PEs lists connections to other disciplinary core ideas (DCIs) within the Arkansas K-12 Science Standards and to the Arkansas Mathematics Standards and the Arkansas English Language Arts Standards.

## Kindergarten Learning Progression by Topic

| Kindergarten | | | | |
|---|---|---|---|---|
| PHYSICAL SCIENCES | | EARTH and SPACE SCIENCES | | LIFE SCIENCES |
| Forces and Interactions: Pushes and Pulls | Weather and Climate | | Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment | |
| K-PS2-1 | K-PS3-1 | K-ESS2-1 | K-ESS2-2 | K-LS1-1 |
| K-PS2-2 | K-PS3-2 | K-ESS3-2 | K-ESS3-1 | |
| | | | K-ESS3-3 | |
| ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE<br>Engineering Design<br>K-ETS1-1, K-ETS1-2, K-ETS1-3 | | | | |

## Kindergarten Learning Progression by Disciplinary Core Idea

| Kindergarten | | | | |
|---|---|---|---|---|
| PHYSICAL SCIENCES | | EARTH and SPACE SCIENCES | | LIFE SCIENCES |
| Matter and Stability: Forces and Interactions | Energy | Earth's Systems | Earth and Human Activity | From Molecules to Organisms: Structures and Processes |
| K-PS2-1 | K-PS3-1 | K-ESS2-1 | K-ESS3-1 | K-LS1-1 |
| K-PS2-2 | K-PS3-2 | K-ESS2-2 | K-ESS3-2 | |
| | | | K-ESS3-3 | |
| ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE<br>Engineering Design<br>K-ETS1-1, K-ETS1-2, K-ETS1-3 | | | | |

## Kindergarten Standards Overview

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- focus on deeper understanding as well as application of content,
- integrate practices, crosscutting concepts, and core ideas, and
- make explicit connections to literacy and math.

### Science and Engineering Practices

Students are expected to demonstrate grade-appropriate proficiency in

- asking questions,
- developing and using models,
- planning and carrying out investigations,
- analyzing and interpreting data,
- designing solutions,
- engaging in argument from evidence, and
- obtaining, evaluating, and communicating information.

Students are expected to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

### Crosscutting Concepts

Students are expected to demonstrate grade-appropriate understanding of

- patterns,
- cause and effect,
- systems and system models,
- interdependence of science, engineering, and technology, and
- influence of engineering, technology, and science on society and the natural world as organizing concepts for the disciplinary core ideas.

### Disciplinary Core Ideas

Students are expected to continually build on and revise their knowledge of

- PS2 - Motion and Stability: Forces and Interactions,
- PS3 - Energy,
- LS1 - Molecules to Organisms: Structures and Processes,
- ESS2 - Earth's Systems,
- ESS3 - Earth and Human Activity, and
- ETS1 - Engineering Design in a K-2 developmental learning progression.

## Physical Sciences (PS)

The (PS) performance expectations in Kindergarten help students formulate answers to the question, “What happens if you push or pull an object with varying amounts of force?” Students apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution.

## Life Sciences (LS)

The (LS) performance expectations in Kindergarten help students explore the question, “Where do animals live and why do they live there?” Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live.

## Earth and Space Sciences (ESS)

The (ESS) performance expectations in Kindergarten help students investigate the question, “What is the weather like today and how it is different from yesterday?” Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather.

## Engineering, Technology, and Applications of Science (ETS)

Engineering design performance expectations in the primary grades help students recognize that creative energy can be a means to solve problems and achieve goals through a systematic process. Children are born with a creative urge to design and build things and it is the task of the teacher to channel this natural tendency. Connections with the other science disciplines help students develop these capabilities in various contexts. The engineering design process involves three stages:

- **Defining engineering problems** begins in Kindergarten as students learn that a situation people want to change can be thought of as a problem that can be solved. By the time they leave second grade students should be able to ask questions and make observations to gather information about the problem so they can envision an object or a tool that would solve it.
- **Designing possible solutions to engineering problems** progresses from the problem definition stage. One of the most challenging aspects of this stage is to keep students from immediately implementing the first solution they think of and to think it through before acting. Students should sketch their ideas or make a physical model to help shape their ideas to meet the requirements of the problem.
- **Comparing different solutions** involves testing each one to see how well it solves a problem or achieves a goal. Consumer product testing is a good model of this capability. Although students in this grade range should not be held accountable for designing controlled experiments, they should be able to think of ways to compare two products to determine which is better for a given purpose.

Students in Kindergarten are beginning to develop the ability to achieve all three performance expectations (K-ETS1-1, K-ETS1-2, K-ETS1-3) related to a single problem in order to understand the interrelated processes of engineering design. Students can use tools and materials to solve simple problems, use visual or physical representations to convey solutions, and compare different solutions to a problem, test them, and determine which is best. These component ideas do not always follow in order. At any stage, a problem-solver can redefine the problem or generate new solutions to replace an idea that is not working.

**Forces and Interactions: Pushes and Pulls**

Students who demonstrate understanding can:

**K-PS2-1** **Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.** [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

**K-PS2-2** **Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*** [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

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**<br>Planning and carrying out investigations to answer questions or test solutions 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.<br>▪ With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)<br>**Analyzing and Interpreting Data**<br>Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.<br>▪ Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)<br>---<br>**Connections to Nature of Science**<br>**Scientific Investigations Use a Variety of Methods**<br>▪ Scientists use different ways to study the world. (K-PS2-1) | **PS2.A: Forces and Motion**<br>▪ Pushes and pulls can have different strengths and directions. (K-PS2-1, K-PS2-2)<br>▪ Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1, K-PS2-2)<br>**PS2.B: Types of Interactions**<br>▪ When objects touch or collide, they push on one another and can change motion. (K-PS2-1)<br>**PS3.C: Relationship Between Energy and Forces**<br>▪ A bigger push or pull makes things speed up or slow down more quickly. (K-PS2-1)<br>**ETS1.A: Defining Engineering Problems**<br>▪ A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (K-PS2-2) | **Cause and Effect**<br>▪ Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1, K-PS2-2) |

*Connections to other DCIs in Kindergarten:* **K-2.ETS1.A** (K-PS2-2); **K-2.ETS1.B** (K-PS2-2)

*Connections to other DCIs across grade levels:* **K-2.ETS1.B** (K-PS2-2); **3.PS2.A** (K-PS2-1, K-PS2-2); **3.PS2.B** (K-PS2-1); **4.PS3.A** (K-PS2-1); **3-5.ETS1.A** (K-PS2-2)

*Connections to the Arkansas English Language Arts Standards –*

**RI.K.1** With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)

**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books on a specific topic and produce simple findings). (K-PS2-1)

**SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)

*Connections to the Arkansas Mathematics Standards –*

**MP.2** Reason abstractly and quantitatively. (K-PS2-1)

**K.MD.A.1** Describe several measurable attributes of a single object, including but not limited to length, weight, height, and temperature. Vocabulary may include short, long, heavy, light, tall, hot, cold, warm, or cool. (K-PS2-1)

**K.MD.A.2** Describe the difference when comparing two objects (side-by-side) with a measurable attribute in common, to see which object has more of or less of the common attribute.(K-PS2-1)

## Weather and Climate

Students who demonstrate understanding can:

**K-PS3-1** **Make observations to determine the effect of sunlight on Earth's surface.** [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]

**K-PS3-2** **Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*** [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

**K-ESS2-1** **Use and share observations of local weather conditions to describe patterns over time.** [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, or warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon or the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations is limited to whole numbers and relative measures such as warmer/cooler.]

**K-ESS3-2** **Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*** [Clarification Statement: Emphasis is on local forms of severe weather.]

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

**Asking Questions and Defining Problems**

Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

- Ask questions based on observations to find more information about the designed world. (K-ESS3-2)

**Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions 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.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1)

**Analyzing and Interpreting Data**

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions 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 materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2)

### Disciplinary Core Ideas

**PS3.B: Conservation of Energy and Energy Transfer**

- Sunlight warms Earth's surface. (K-PS3-1, K-PS3-2)

**ESS2.D: Weather and Climate**

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)

**ESS3.B: Natural Hazards**

- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2)

**ETS1.A: Defining and Delimiting an Engineering Problem**

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-ESS3-2)

### Crosscutting Concepts

**Patterns**

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

**Cause and Effect**

- Events have causes that generate observable patterns. (K-PS3-1, K-PS3-2, K-ESS3-2)

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**Connections to Engineering, Technology, and Applications of Science**

**Interdependence of Science, Engineering, and Technology**

- People encounter questions about the natural world every day. (K-ESS3-2)

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

**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 information to describe patterns in the natural world. (K-ESS3-2)

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**Connections to Nature of Science**

**Scientific Investigations Use a Variety of Methods**

- Scientists use different ways to study the world. (K-PS3-1)

**Science Knowledge is Based on Empirical Evidence**

- Scientists look for patterns and order when making observations about the world. (K-ESS2-1)

*Connections to other DCIs in Kindergarten:* **K-2.ETS1.A** (K-PS3-2, K-ESS3-2); **K-2.ETS1.B** (K-PS3-2)

*Connections to other DCIs across grade levels:* **1.PS4.B** (K-PS3-1, K-PS3-2); **2.ESS1.C** (K-ESS3-2); **2.ESS2.A** (K-ESS2-1); **K-2.ETS1.B** (K-PS3-2); **3.ESS2.D** (K-PS3-1, K-ESS2-1); **3.ESS3.B** (K-ESS3-2); **4.ESS2.A** (K-ESS2-1); **4.ESS3.B** (K-ESS3-2); **4.ESS2.E** (K-ESS2-2); **3-5.ETS1.A** (K-PS3-2)

*Connections to the Arkansas English Language Arts Standards –*

**RI.K.1** With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)

**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books on a specific topic and produce simple findings). (K-PS3-1, K-PS3-2, K-ESS2-1)

**SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2)

*Connections to the Arkansas Mathematics Standards –*

**MP.2** Reason abstractly and quantitatively. (K-ESS2-1)

**MP.4** Model with mathematics. (K-ESS2-1, K-ESS3-2)

**K.CC** Counting and Cardinality (K-ESS3-2)

**K.CC.A** Know number names and the count sequence. (K-ESS2-1)

**K.MD.A.1** Describe several measurable attributes of a single object, including but not limited to length, weight, height, and temperature. (K-ESS2-1)

**K.MD.A.2** Describe the difference when comparing two objects (side-by-side) with a measureable attribute in common, to see which object has more of or less of the common attribute. (K-ESS3-1, K-ESS3-2)

**K.MD.B.3** Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

## KINDERGARTEN

**Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment**

Students who demonstrate understanding can:

**K-LS1-1** **Use observations to describe patterns of what plants and animals (including humans) need to survive.** [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and that all living things need water.]

**K-ESS2-2** **Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.** [Clarification Statement: Examples of plants and animals changing their environment could include squirrels digging in the ground to hide food and tree roots breaking concrete.]

**K-ESS3-1** **Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.** [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]

**K-ESS3-3** **Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*** [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

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

**Developing and Using Models**

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (e.g., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Use a model to represent relationships in the natural world. (K-ESS3-1)

**Analyzing and Interpreting Data**

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Construct an argument with evidence to support a claim. (K-ESS2-2)

**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.

- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

### Disciplinary Core Ideas

**LS1.C: Organization for Matter and Energy Flow in Organisms**

- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)

**ESS2.E: Biogeology**

- Plants and animals can change their environment. (K-ESS2-2)

**ESS3.A: Natural Resources**

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)

**ESS3.C: Human Impacts on Earth Systems**

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS2-2, K-ESS3-3)

**ETS1.B: Developing Possible Solutions**

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-ESS3-3)

### Crosscutting Concepts

**Patterns**

- Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1)

**Cause and Effect**

- Events have causes that generate observable patterns. (K-ESS3-3)

**Systems and System Models**

- Systems in the natural and designed world have parts that work together. (K-ESS2-2, K-ESS3-1)

| | | |
|---|---|---|
| **Connections to Nature of Science**<br><br>**Scientific Knowledge is Based on Empirical Evidence**<br>▪ Scientists look for patterns and order when making observations about the world. (K-LS1-1) | | |

*Connections to other DCIs in Kindergarten:* **K-2.ETS1.A** (K-ESS3-3)

*Connections to other DCIs across grade levels:* **1.LS1.A** (K-LS1-1, K-ESS3-1); **2.LS2.A** (K-LS1-1); **K-2.ETS1.B** (K-ESS3-3); **3.LS2.C** (K-LS1-1); **3.LS4.B** (K-LS1-1); **4.ESS2.E** (K-ESS2-2); **4.ESS3.A** (K-ESS3-3); **5.LS1.C** (K-LS1-1); **5.LS2.A** (K-LS1-1) (K-ESS3-1); **5.ESS2.A** (K-ESS2-2, K-ESS3-1); **5.ESS3.C** (K-ESS3-3)

*Connections to the Arkansas English Language Arts Standards –*

**RI.K.1** With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)

**W.K.1** Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., My favorite book is…). (K-ESS2-2)

**W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-2, K-ESS3-3)

**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books on a specific topic and produce simple findings). (K-LS1-1)

**SL.K.5** Add drawings or other visual displays to descriptions of familiar people, places, things, and events as desired to provide additional detail. (K-ESS3-1)

*Connections to the Arkansas Mathematics Standards –*

**MP.2** Reason abstractly and quantitatively. (K-ESS3-1)

**MP.4** Model with mathematics. (K-ESS3-1)

**K.CC** Counting and Cardinality (K-ESS3-1)

**K.MD.A.2** Describe the difference when comparing two objects (side-by-side) with a measurable attribute in common, to see which object has more of or less of the common attribute. (K-LS1-1)

## KINDERGARTEN

### Engineering, Technology, and Applications of Science

Students who demonstrate understanding can:

**K-ETS1-1** **Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.**

**K-ETS1-2** **Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.**

**K-ETS1-3** **Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**

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

**Asking Questions and Defining Problems**

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world. (K-ETS1-1)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-ETS1-1)

**Developing and Using Models**

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (K-ETS1-2)

**Analyzing and Interpreting Data**

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (K-ETS1-3)

#### Disciplinary Core Ideas

**ETS1.A: Defining and Delimiting Engineering Problems**

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-ETS1-1)
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-ETS1-1)

**ETS1.B: Developing Possible Solutions**

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-ETS1-2)

**ETS1.C: Optimizing the Design Solution**

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-ETS1-3)

#### Crosscutting Concepts

**Structure and Function**

- The shape and stability of structures of natural and designed objects are related to their function(s). (K-ETS1-2)

*Connections to K-2-ETS1.A: Defining and Delimiting Engineering Problems include:* **Kindergarten:** (K-PS2-2, K-ESS3-2)
*Connections to K-2-ETS1.B: Developing Possible Solutions to Problems include:* **Kindergarten:** (K-ESS3-3); **First Grade:** (1-PS4-4); **Second Grade:** (2-LS2-2)
*Connections to K-2-ETS1.C: Optimizing the Design Solution include:* **Second Grade:** (2-ESS2-1)

*Connections to other DCIs across grade levels:* **3-5.ETS1.A** (K-ETS1-1, K-ETS1-2, K-ETS1-3); **3-5.ETS1.B** (K-ETS1-2, K-ETS1-3); **3-5.ETS1.C** (K-ETS1-1, K-ETS1-2, K-ETS1-3)

*Connections to the Arkansas English Language Arts Standards –*

**RI.K.1** With prompting and support, ask and answer questions about key details in a text. (K-ETS1-1)

**W.K.6** With guidance and support from adults, explore a variety of digital tools to produce some writing, including in collaboration with peers. (K-ETS1-1, K-ETS1-3)

**W.K.8** With prompting and support, recall information from experiences or gather information from provided sources to answer a question. (K-ETS1-1,K-ETS1-3)

**SL.K.5** Add drawings or other visual displays to descriptions of familiar people, places, things, and events as desired to provide additional detail. (K-ETS1-2)

*Connections to the Arkansas Mathematics Standards –*

**MP.2** Reason abstractly and quantitatively. (K-ETS1-1, K-ETS1-3)

**MP.4** Model with mathematics. (K-ETS1-1, K-ETS1-3)

**MP.5** Use appropriate tools strategically. (K-ETS1-1, K-ETS1-3)

## Contributors

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