ARKANSAS

K-12 SCIENCE STANDARDS

EDUCATION FOR A NEW GENERATION

Grade 2

2015

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

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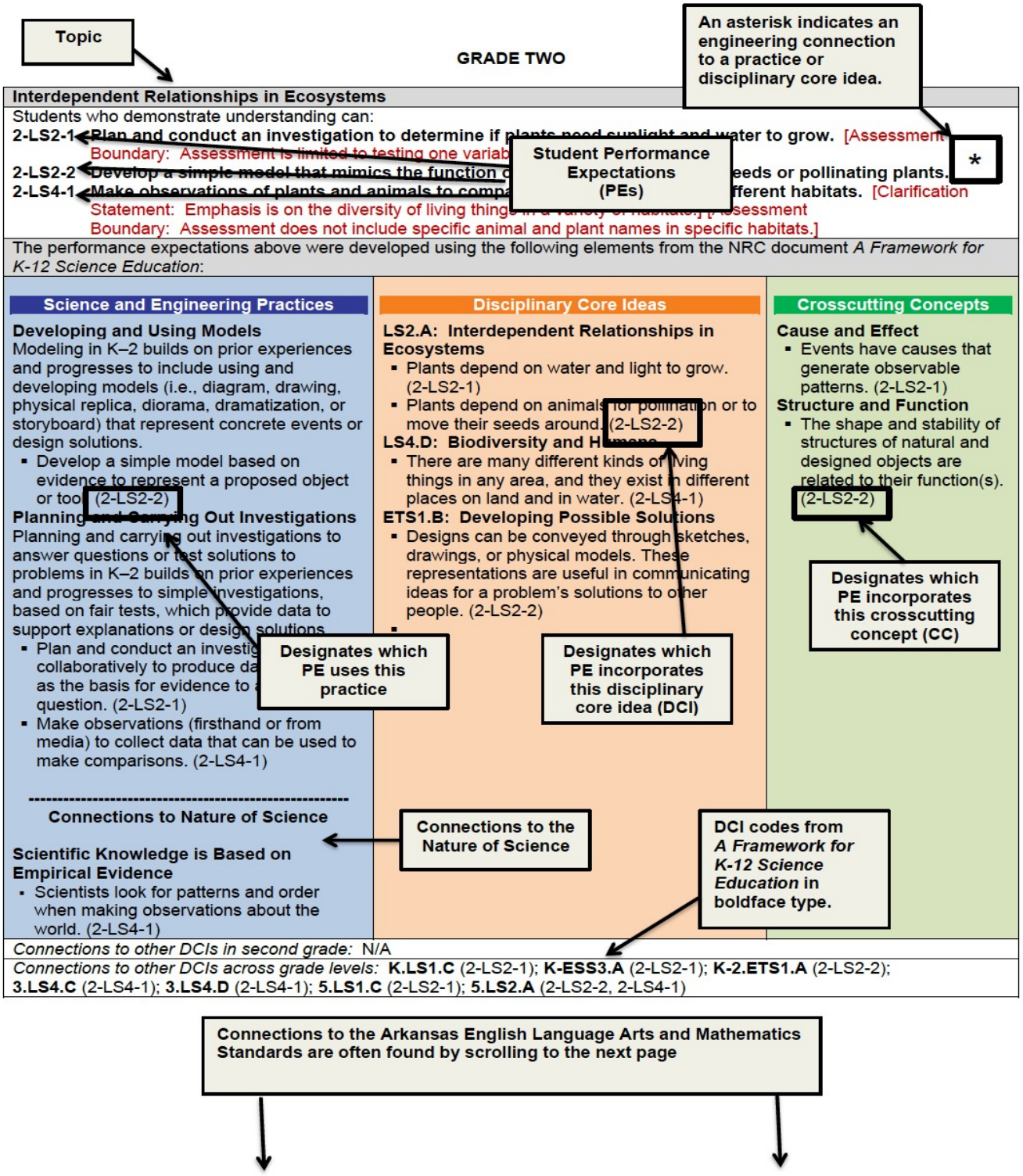
How to Read
Arkansas K-12 Science Standards



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 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 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.
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.

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.

Grade 2 Learning Progression by Topic

Grade 2		
PHYSICAL SCIENCES	LIFE SCIENCES	EARTH and SPACE SCIENCES
Structure and the Properties of Matter	Interdependent Relationships in Ecosystems	Earth's Systems: Processes that Shape the Earth
2-PS1-1	2-LS2-1	2-ESS1-1
2-PS1-2	2-LS2-2	2-ESS2-1
2-PS1-3	2-LS4-1	2-ESS2-2
2-PS1-4		2-ESS2-3
ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE Engineering Design 2-ETS1-1, 2-ETS1-2, 2-ETS1-3		

Grade 2 Learning Progression by Disciplinary Core Idea

Grade 2				
PHYSICAL SCIENCES	LIFE SCIENCES		EARTH and SPACE SCIENCES	
Matter and Its Interactions	Ecosystems: Interactions, Energy, and Dynamics	Biological Evolution: Unity and Diversity	Earth's Place in the Universe	Earth's Systems
2-PS1-1	2-LS2-1	2-LS4-1	2-ESS1-1	2-ESS2-1
2-PS1-2	2-LS2-2			2-ESS2-2
2-PS1-3				2-ESS2-3
2-PS1-4				
ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE Engineering Design 2-ETS1-1, 2-ETS1-2, 2-ETS1-3				

Second Grade 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.

Science and Engineering Practices

Students are expected to demonstrate grade-appropriate proficiency in

- developing and using models,
- planning and carrying out investigations,
- analyzing and interpreting data,
- constructing explanations and designing solutions, and
- 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,
- energy and matter,
- structure and function,
- stability and change, 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

- PS1 - Matter and Its Interactions,
- LS2 - Ecosystems: Interactions, Energy, and Dynamics,
- LS4 - Biological Evolution: Unity and Diversity,
- ESS1 - Earth's Place in the Universe,
- ESS2 - Earth's Systems, and
- ETS1 - Engineering Design in a K-2 developmental learning progression.

Physical Sciences (PS)

The (PS) performance expectations in second grade help students formulate answers to the questions, “How do the properties of materials determine their use?” and “How are materials similar and different from one another?” Students develop an understanding of observable properties of materials at this level through analysis and classification of different materials.

Life Science (LS)

The (LS) performance expectations in second grade help students explore the questions, “What do plants need to grow?” and “How many types of organisms live in a place?” Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students compare the diversity of life in different habitats.

Earth and Space Science (ESS)

The (ESS) performance expectations in second grade help students investigate the questions, “How does the surface of the Earth change over time?”, and “What are the different land forms and bodies of water?” Students apply their understanding of the idea that wind and water can change the shape of the land and compare design solutions to slow or prevent such changes. Students use information and make models to identify and represent landforms and bodies of water found on Earth.

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.

By the time students leave the second grade they should be able to achieve all three performance expectations (2-ETS1-1, 2-ETS1-2, 2-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.

Structure and Properties of Matter

Students who demonstrate understanding can:

2-PS1-1 **Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.** [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

2-PS1-2 **Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.*** [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]

2-PS1-3 **Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.** [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

2-PS1-4 **Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.** [Clarification Statement: Examples of reversible changes could include materials such as water or butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

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

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.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)

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. (2-PS1-2)

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.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3)

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. (2-PS1-4)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
- Different properties are suited to different purposes. (2-PS1-2, 2-PS1-3)
- A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed world can be observed. (2-PS1-1)

Cause and Effect

- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Energy and Matter

- Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

Connections to Engineering, Technology, and Applications of Science

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

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

--- **Connections to Nature of Science** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)		

Connections to other DCIs in second grade: N/A

Connections to other DCIs across grade levels: **4.ESS2.A** (2-PS1-3); **5.PS1.A** (2-PS1-1, 2-PS1-2, 2-PS1-3); **5.PS1.B** (2-PS1-4); **5.LS2.A** (2-PS1-3)

Connections to the Arkansas English Language Arts Standards –

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4)

RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4)

RI.2.8 Describe how an author uses reasons to support particular points in a text. (2-PS1-2, 2-PS1-4)

W.2.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4)

W.2.7 Participate in shared research and writing projects (e.g., read a variety of print and/or digital sources on a single topic to produce a report; record science observations). (2-PS1-1, 2-PS1-2, 2-PS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1, 2-PS1-2, 2-PS1-3)

Connections to the Arkansas Mathematics Standards –

MP.2 Reason abstractly and quantitatively. (2-PS1-2)

MP.4 Model with mathematics. (2-PS1-1, 2-PS1-2)

MP.5 Use appropriate tools strategically. (2-PS1-2)

2.MD.D.10 Draw a picture graph and a bar graph, with single-unit scale, to represent a data set with up to four categories. Solve simple put-together and take-apart problems and compare problems using information presented in a bar graph. (2-PS1-1, 2-PS1-2)

GRADE TWO

Interdependent Relationships in Ecosystems

Students who demonstrate understanding can:

2-LS2-1 **Plan and conduct an investigation to determine if plants need sunlight and water to grow.** [Assessment Boundary: Assessment is limited to testing one variable at a time.]

2-LS2-2 **Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.***

2-LS4-1 **Make observations of plants and animals to compare the diversity of life in different habitats.** [Clarification Statement: Emphasis is on the diversity of living things in a variety of habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

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 (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. (2-LS2-2)

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.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)
- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (2-LS4-1)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS2-1)
- Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

LS4.D: Biodiversity and Humans

- There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

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. (2-LS2-2)

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to other DCIs in second grade: N/A

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

Connections to the Arkansas English Language Arts Standards –

W.2.7 Participate in shared research and writing projects (e.g., read a variety of print and/or digital sources on a single topic to produce a report; record science observations). (2-LS2-1, 2-LS4-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1, 2-LS4-1)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2)

Connections to the Arkansas Mathematics Standards –

MP.2 Reason abstractly and quantitatively. (2-LS2-1, 2-LS4-1)

MP.4 Model with mathematics. (2-LS2-1, 2-LS2-2, 2-LS4-1)

MP.5 Use appropriate tools strategically. (2-LS2-1)

2.MD.D.10 Draw a picture graph and a bar graph, with single-unit scale, to represent a data set with up to four categories. Solve simple put-together and take-apart problems and compare problems using information presented in a bar graph. (2-LS2-2, 2-LS4-1)

Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

2-ESS1-1 **Use information from several sources to provide evidence that Earth events can occur quickly or slowly.** [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary: Assessment does not include quantitative measurements of timescales.]

2-ESS2-1 **Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*** [Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]

2-ESS2-2 **Develop a model to represent the shapes and kinds of land and bodies of water in an area.** [Assessment Boundary: Assessment does not include quantitative scaling in models.]

2-ESS2-3 **Obtain information to identify where water is found on Earth and that it can be solid or liquid.**

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 (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a model to represent patterns in the natural world. (2-ESS2-2)

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.

- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)
- Compare multiple solutions to a problem. (2-ESS2-1)

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.

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

ESS2.A: Earth Materials and Systems

- Wind and water can change the shape of the land. (2-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

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. (2-ESS2-1)

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed. (2-ESS2-2, 2-ESS2-3)

Stability and Change

- Things may change slowly or rapidly. (2-ESS1-1, 2-ESS2-1)

Connections to Engineering, Technology, and Applications of Science

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

- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World

- Scientists study the natural and material world. (2-ESS2-1)

Connections to other DCIs in second grade: **2.PS1.A** (2-ESS2-3)

Connections to other DCIs across grade levels: **K-2.ETS1.A** (2-ESS2-1); **3.LS2.C** (2-ESS1-1); **4.ESS1.C** (2-ESS1-1); **4.ESS2.A** (2-ESS1-1, 2-ESS2-1); **4.ESS2.B** (2-ESS2-2); **3-5.ETS1.A** (2-ESS2-1); **3-5.ETS1.B** (2-ESS2-1); **3-5.ETS1.C** (2-ESS2-1); **5.ESS2.A** (2-ESS2-1); **5.ESS2.C** (2-ESS2-2, 2-ESS2-3)

Connections to the Arkansas English Language Arts Standards –

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ESS1-1)

RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1, 2-ESS2-1)

RI.2.9 Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish some writing, including in collaboration with peers. (2-ESS1-1, 2-ESS2-3)

W.2.7 Participate in shared research and writing projects (e.g., read a variety of print and/or digital sources on a single topic to produce a report; record science observations). (2-ESS1-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1, 2-ESS2-3)

SL.2.2 Recount or describe key ideas or details from a text read aloud, information presented orally, or through other media. (2-ESS1-1)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-ESS2-2)

Connections to the Arkansas Mathematics Standards –

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

MP.4 Model with mathematics. (2-ESS1-1, 2-ESS2-1, 2-ESS2-2)

MP.5 Use appropriate tools strategically. (2-ESS2-1)

2.NBT.A Understand place value. (2-ESS1-1)

2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Model and describe numbers within 1000 as groups of 10 in a variety of ways. (2-ESS2-2)

2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, and write equations with a symbol for the unknown number to represent the problem. (2-ESS2-1)

GRADE TWO

Engineering, Technology, and Applications of Science

Students who demonstrate understanding can:

2-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.**

2-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.**

2-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. (2-ETS1-1)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (2-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. (2-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. (2-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. (2-ETS1-1)
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (2-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. (2-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. (2-ETS1-3)

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-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** (2-ETS1-1, 2-ETS1-2, 2-ETS1-3); **3-5.ETS1.B** (2-ETS1-2, 2-ETS1-3); **3-5.ETS1.C** (2-ETS1-1, 2-ETS1-2, 2-ETS1-3)

Connections to the Arkansas English Language Arts Standards –

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ETS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish some writing, including in collaboration with peers. (2-ETS1-1, 2-ETS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-ETS1-1, 2-ETS1-3)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-ETS1-2)

Connections to the Arkansas Mathematics Standards –

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

MP.4 Model with mathematics. (2-ETS1-1, 2-ETS1-3)

MP.5 Use appropriate tools strategically. (2-ETS1-1, 2-ETS1-3)

2.MD.D.10 Draw a picture graph and a bar graph, with single-unit scale, to represent a data set with up to four categories. Solve simple put-together and take-apart problems and compare problems using information presented in a bar graph. (2-ETS1-1, 2-ETS1-3)

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