



ARKANSAS

K-12 SCIENCE STANDARDS

EDUCATION FOR A NEW GENERATION

Grade 1

2015

How to Read Arkansas K-12 Science Standards

Topic

GRADE TWO

An asterisk indicates an engineering connection to a practice or disciplinary core idea.

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.] 2-LS2-2 Develop a simple model that mimics the function of plants or animals. [Assessment Boundary: Assessment is limited to testing one variable.] 2-LS4-1 Make observations of plants and animals to compare growth and behavior. [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]	Student Performance Expectations (PEs)	seeds or pollinating plants. [Clarification: 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 <i>A Framework for K-12 Science Education</i>:		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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 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)	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)	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 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)	Connections to the Nature of Science DCI codes from <i>A Framework for K-12 Science Education</i> in boldface type.	
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 and Mathematics Standards are often found by scrolling to the next page

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.

Grade 1 Learning Progression by Topic

Grade 1		
PHYSICAL SCIENCES	LIFE SCIENCES	EARTH and SPACE SCIENCES
Waves: Light and Sound	Structure, Function, and Information Processing	Space Systems: Patterns and Cycles
1-PS4-1	1-LS1-1	1-ESS1-1
1-PS4-2	1-LS1-2	1-ESS1-2
1-PS4-3	1-LS3-1	
1-PS4-4		
ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE Engineering Design 1-ETS1-1, 1-ETS1-2, 1-ETS1-3		

Grade 1 Learning Progression by Disciplinary Core Idea

Grade 1			
PHYSICAL SCIENCES	LIFE SCIENCES		EARTH and SPACE SCIENCES
Waves and Their Applications in Technologies for Information Transfer	From Molecules to Organisms: Structure and Processes	Heredity: Inheritance and Variation of Traits	Earth's Place in the Universe
1-PS4-1	1-LS1-1	1-LS3-1	1-ESS1-1
1-PS4-2	1-LS1-2		1-ESS1-2
1-PS4-3			
1-PS4-4			
ENGINEERING, TECHNOLOGY, and APPLICATIONS of SCIENCE Engineering Design 1-ETS1-1, 1-ETS1-2, 1-ETS1-3			

First 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

- planning and carrying out investigations,
- analyzing and interpreting data,
- constructing explanations and designing solutions, and
- obtaining, evaluating, and communicating information.

Students are expected to use these 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,
- structure and function, 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

- PS4 - Waves and their Applications in Technologies for Information Transfer,
- LS1 - Molecules to Organisms: Structures and Processes,
- LS3 - Heredity: Inheritance and Variation of Traits
- ESS1 - Earth's Place in the Universe, and
- ETS1 - Engineering Design in a K-2 developmental learning progression.

Physical Sciences (PS)

The (PS) performance expectations in first grade help students formulate answers to the questions, “What happens when materials vibrate?” and “What happens when there is no light?” Students develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light.

Life Sciences (LS)

The (LS) performance expectations in first grade help students explore the questions, “What are some ways plants and animals meet their needs so that they can survive and grow?” and “How are parents and their children similar and different?” Students develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are alike, but not exactly the same as, their parents.

Earth and Space Sciences (ESS)

The (ESS) performance expectations in first grade help students investigate the question, “What objects are in the sky and how do they seem to move?” Students observe, describe, and predict some patterns of the movement of objects in the sky.

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 the first grade are still developing the ability to achieve all three performance expectations (1-ETS1-1, 1-ETS1-2, 1-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.

GRADE ONE

Waves: Light and Sound

Students who demonstrate understanding can:

- 1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.** [Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]
- 1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.** [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]
- 1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.** [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]
- 1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*** [Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones”, and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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 investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1, 1-PS4-3) 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 (1-PS4-2) - Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)	PS4.A: Wave Properties - Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1) PS4.B: Electromagnetic Radiation - Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2) - Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS4-3) PS4.C: Information Technologies and Instrumentation - People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)	Cause and Effect - Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1, 1-PS4-2, 1-PS4-3) Connections to Engineering, Technology, and Applications of Science 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. (1-PS4-4)

----- Connections to Nature of Science Scientific Investigations Use a Variety of Methods - Science investigations begin with a question. (1-PS4-1) - Scientists use different ways to study the world. (1-PS4-1)		
Connections to other DCIs in first grade: N/A		
Connections to other DCIs across grade levels: K-2.ETS1.A (1-PS4-4); 2.PS1.A (1-PS4-3); K-2.ETS1.B (1-PS4-4); 4.PS4.B (1-PS4-4); 4.PS4.C (1-PS4-4); 3-5.ETS1.A (1-PS4-4)		
Connections to the Arkansas English Language Arts Standards – 1.W.2.S Write an informative or explanatory piece about a topic, using facts from a source. (1-PS4-2) 1.W.9.P Participate in teacher-led research projects and gather information from experiences and/or provided sources to produce a response. (1-PS4-1, 1-PS4-2, 1-PS4-3, 1-PS4-4) 1.W.2.S Write an informative or explanatory piece about a topic, using facts from a source. (1-PS4-1, 1-PS4-2, 1-PS4-3) 1.CC.1.OL Participate in collaborative conversations, following class created discussion guidelines. (1-PS4-1, 1-PS4-2, 1-PS4-3) Connections to the Arkansas Mathematics Standards – AR.M.5 Identify relationships using structure and patterns. (1-PS4-4) 1.GM.3 Express the length of an object as a whole number of units by laying multiple copies of a shorter object end to-end, understanding that the length of one object is equal to the number of same-size units that span the object with no gaps or overlaps. (1-PS4-4) 1.GM.4 Order three objects by their length, indirectly comparing the lengths of two objects by using a third object. (1-PS4-4)		

GRADE ONE

Structure, Function, and Information Processing		
Students who demonstrate understanding can:		
1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.* [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and detecting intruders by mimicking eyes or ears.] 1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) or the responses of the parents (such as feeding, comforting, and protecting the offspring).] 1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance, animals that undergo metamorphosis or hybrids.]		
The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i> :		
Science and Engineering Practices 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. (1-LS3-1) - Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1) 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. - Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)	Disciplinary Core Ideas LS1.A: Structure and Function - All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1) LS1.B: Growth and Development of Organisms - Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2) LS1.D: Information Processing - Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1) LS3.A: Inheritance of Traits - Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents. (1-LS3-1) LS3.B: Variation of Traits - Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1)	Crosscutting Concepts Patterns - Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2, 1-LS3-1) Structure and Function - The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1) ----- 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 by built using materials derived from the natural world. (1-LS1-1)

Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence Scientists look for patterns and order when making observations about the world. (1-LS1-2)		
<i>Connections to other DCIs in first grade: N/A</i>		
<i>Connections to other DCIs across grade levels: K-2.ETS1.A (1-LS1-1); 3.LS2.D (1-LS1-2) 3.LS3.A (1-LS3-1); 3.LS3.B (1-LS3-1); 4.LS1.A (1-LS1-1); 4.LS1.D (1-LS1-1); 3-5.ETS1.A (1-LS1-1)</i>		
<i>Connections to the Arkansas English Language Arts Standards –</i> 1.RC.1.RF Ask questions about key details in a text. (1-LS1-2, 1-LS3-1) 1.RC.2.RF Answer questions about key details in a text. (1-LS1-2, 1-LS3-1) 1.RC.13.RI Identify reasons an author provides to support the main points in a text. (1-LS1-2) 1.RC.14.RI Compare and contrast two texts on the same topic. (1-LS1-2) 1.RC.15.RI Identify text elements (e.g., title, captions, photographs, diagrams, descriptions) in an informational text. (1-LS1-2) 1.RC.16.RI Use text features (e.g., title, author, illustrator, table of contents, bold font, italics) to locate key facts and information. (1-LS1-2) 1.RC.17.RI Explain how visual images (e.g., charts, graphs, illustrations) support a text by clarifying or providing key details. (1-LS1-2) 1.RC.18.RI Identify the author's purpose of a text. (1-LS1-2) 1.W.9.P Participate in teacher-led research projects and gather information from experiences and/or provided sources to produce a response. (1-LS1-1, 1-LS3-1) 1.W.2.S Write an informative or explanatory piece about a topic, using facts from a source. (1-LS3-1)		
<i>Connections to the Arkansas Mathematics Standards –</i> AR.M.2 Applying reasoning about quantities and relationships. (1-LS3-1) AR.M.5 Identify relationships using structure and patterns. (1-LS3-1) 1.CAR.4 Use concrete models or drawings to add within 100, including a two-digit number and a one-digit number as well as a two-digit number and a multiple of ten; relate strategy used to a written expression or equation, explaining reasoning. (1-LS1-2) 1.GM.4 Order three objects by their length, indirectly comparing the lengths of two objects by using a third object. (1-LS3-1) 1.NPV.5 Use concrete models or drawings to subtract multiples of 10 from multiples of 10 (within the range of 10-90), relate the strategy to a written expression or equation, and explain the reasoning used to solve. (1-LS1-2) 1.NPV.6 Use mental strategies to find 10 more or 10 less than a given two-digit number. (1-LS1-2) 1.NPV.7 Compare two two-digit numbers using symbols (<, >, =) based on the value of tens and ones in the given numbers. (1-LS1-2)		

GRADE ONE

Space Systems: Patterns and Cycles

Students who demonstrate understanding can:

- 1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted.** [Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars, other than our sun, are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.]
- 1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year.** [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations 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. (1-ESS1-2) 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. (1-ESS1-1)	ESS1.A: The Universe and its Stars - Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1) ESS1.B: Earth and the Solar System - Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)	Patterns - Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1, 1-ESS1-2) Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems - Science assumes natural events happen today as they happened in the past. (1-ESS1-1) - Many events are repeated. (1-ESS1-1)

Connections to other DCIs in first grade: N/A

Connections to other DCIs across grade levels: **3.PS2.A** (1-ESS1-1); **5.PS2.B** (1-ESS1-1, 1-ESS1-2)
5-ESS1.B (1-ESS1-1, 1-ESS1-2)

Connections to the Arkansas English Language Arts Standards –

- 1.W.9.P** Participate in teacher-led research projects and gather information from experiences and/or provided sources to produce a response. (1-ESS1-1, 1-ESS1-2)
- 1.W.2.S** Write an informative or explanatory piece about a topic, using facts from a source. (1-ESS1-1, 1-ESS1-2)

Connections to the Arkansas Mathematics Standards –

- AR.M.2** Applying reasoning about quantities and relationships. (1-ESS1-2)
- AR.M.4** Select and use relationships and tools. (1-ESS1-2)
- AR.M.5** Identify relationships using structure and patterns.. (1-ESS1-2)
- 1.CAR.6** Solve real-world problems involving addition and subtraction within 20; Problem types include: adding to, taking from, putting together, taking apart, and comparing with unknowns present throughout the addition and subtraction problem. (1-ESS1-2)
- 1.DA.1** Organize, represent, and interpret data with up to three categories (e.g., tally tables, picture graphs, bar graphs). (1-ESS1-2)
- 1.DA.2** Ask and answer questions about the total number represented such as how many in each category and how many more or less in one category compared to another. (1-ESS1-2)

GRADE ONE

Engineering, Technology, and Applications of Science		
Students who demonstrate understanding can:		
1-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.		
1-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.		
1-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 <i>A Framework for K-12 Science Education</i> :		
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. (1-ETS1-1) - Define a simple problem that can be solved through the development of a new or improved object or tool. (1-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. (1-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. (1-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. (1-ETS1-1) - Asking questions, making observations, and gathering information are helpful in thinking about problems. (1-ETS1-1) - Before beginning to design a solution, it is important to clearly understand the problem. (1-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. (1-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. (1-ETS1-3)	Crosscutting Concepts Structure and Function The shape and stability of structures of natural and designed objects are related to their function(s). (1-ETS1-2)
<i>Connections to K-2-ETS1.A: Defining and Delimiting Engineering Problems include: Kindergarten: (K-PS2-2, K-ESS3-2)</i> <i>Connections to K-2-ETS1.B: Developing Possible Solutions to Problems include: Kindergarten: (K-ESS3-3);</i> First Grade: (1-PS4-4); Second Grade: (2-LS2-2) <i>Connections to K-2-ETS1.C: Optimizing the Design Solution include: Second Grade: (2-ESS2-1)</i>		
<i>Connections to other DCIs across grade levels: 3-5.ETS1.A (1-ETS1-1, 1-ETS1-2, 1-ETS1-3); 3-5.ETS1.B (1-ETS1-2, 1-ETS1-3); 3-5.ETS1.C (1-ETS1-1, 1-ETS1-2, 1-ETS1-3)</i>		

Connections to the Arkansas English Language Arts Standards –

1.RC.1.RF Ask questions about key details in a text. (1-ETS1-1)

1.RC.2.RF Answer questions about key details in a text. (1-ETS1-1)

1.W.2.S Write an informative or explanatory piece about a topic, using facts from a source. (1-ETS1-1,1-ETS1-3)

1.CC.4.P Use visual displays to clarify ideas, thoughts, and feelings. (1-ETS1-2)

Connections to the Arkansas Mathematics Standards –

AR.M.2 Applying reasoning about quantities and relationships. (1-ETS1-1, 1-ETS1-3)

AR.M.4 Select and use relationships and tools. (1-ETS1-1, 1-ETS1-3)

AR.M.5 Identify relationships using structure and patterns. (1-ETS1-1, 1-ETS1-3)