Grade K
Science
Item Specifications

Missouri
DEPARTMENT OF ELEMENTARY & SECONDARY
EDUCATION

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Introduction

In 2014 Missouri legislators passed House Bill 1490, mandating the development of the Missouri Learning Expectations. In April of 2016, these Missouri Learning Expectations were adopted by the State Board of Education. Groups of Missouri educators from across the state collaborated to create the documents necessary to support the implementation of these expectations.

One of the documents developed is the item specification document, which includes all Missouri grade level/course expectations arranged by domains/strands. It defines what could be measured on a variety of assessments. The document serves as the foundation of the assessment development process.

Although teachers may use this document to provide clarity to the expectations, these specifications are intended for summative, benchmark, and large-scale assessment purposes.

Components of the item specifications include:

Expectation Unwrapped breaks down a list of clearly delineated content and skills the students are expected to know and be able to do upon mastery of the Expectation.

Depth of Knowledge (DOK) Ceiling indicates the highest level of cognitive complexity that would typically be assessed on a large scale assessment. The DOK ceiling is not intended to limit the complexity one might reach in classroom instruction.

Item Format indicates the types of test questions used in large scale assessment. For each expectation, the item format specifies the type best suited for that particular expectation.

Content Limits/Assessment Boundaries are parameters that item writers should consider when developing a large scale assessment. For example, some expectations should not be assessed on a large scale assessment but are better suited for local assessment.

Sample stems are examples that address the specific elements of each expectation and address varying DOK levels. The sample stems provided in this document are in no way intended to limit the depth and breadth of possible item stems. The expectation should be assessed in a variety of ways.

Possible Evidence indicates observable methods in which a student can show understanding of the expectations.

Stimulus Materials defines types of stimulus materials that can be used in the item stems.

Grade K SCIENCE

Physical Science		K.PS1.A.1
Core Idea	**Matter and Its Interactions**	
Component	**Structure and Properties of Matter**	
MLS	Make qualitative observations of the physical properties of objects (i.e., size, shape, color, mass).	

Expectation Unwrapped

SCIENCE AND ENGINEERING PRACTICES
- Communicate observations based on size, shape, color, and mass of common objects.

DISCIPLINARY CORE IDEAS
Structure and Properties of Matter
- Objects (matter) can be described and identified by their observable properties.

CROSSCUTTING CONCEPTS
- Make observations about objects based on physical characteristics.

DOK Ceiling
2

Item Format
Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- Assessment shall include methods of communication relevant to kindergarten grade-appropriate practices that may include using tables, diagrams, graphs, and models.
- Tasks should not assess mass.
- Observations should be limited to qualitative terms: size, shape, color, and mass.
- Observations may include comparative terms (e.g., smaller, larger, thinner, and wider).
- Patterns should not include repetitive sequences but are repeating events and relationships of shapes, attributes, and structures (classification of like items).

Possible Evidence

- With guidance, students communicate observations using graphical or visual displays (e.g., pictures, pictographs, drawings, written observations, tables, charts). The observations students communicate include qualitative observations of physical properties of objects (i.e., size, shape, color, mass).
- Matching objects based on physical properties

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Sample Stems

Grade K SCIENCE

Physical Sciences		K.PS2.A.1
Core Idea	**Motion and Stability: Forces and Interactions**	
Component	**Forces and Motion**	
MLS	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.	

Expectation Unwrapped	**DOK Ceiling**
[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.] **SCIENCE AND ENGINEERING PRACTICES** • With guidance, students plan and conduct an investigation in collaboration with peers. **DISCIPLINARY CORE IDEAS** **Forces and Motion** • Understand pushes and pulls can have different strengths and directions. • Compare how pushes and pulls can change the speed or direction of an object. • Identify that a bigger push or pull makes things speed up or slow down more quickly. **CROSSCUTTING CONCEPTS** • Generalize that a bigger push or pull makes things speed up and move more quickly than a smaller push or pull. **ENGINEERING DESIGN** • Refer to Engineering, Technology, and Application of Science K.ETS1.A.1	3 **Item Format** Selected Response Constructed Response Technology Enhance - option Drag/Drop
Content Limits/Assessment Boundaries	**Sample Stems**
• Tasks should not assess planning and conducting an investigation independently. • Tasks should not assess friction or force. • Tasks should assess either directions or strengths, not both. • Tasks should avoid non-contact forces (i.e., magnetic forces). • Relative terms (e.g. slower, faster, stronger, weaker, harder, softer) should be used.	

<table>
<tr><td>

Possible Evidence

- With guidance, students collaboratively identify the phenomenon under investigation, which includes the following idea: the effect caused by different strengths and directions of pushes and pulls on the motion of an object.
- With guidance, students collaboratively develop an investigation plan to determine the relationship between the strength and direction of pushes and pulls and the motion of an object (i.e., qualitative measures or expressions of strength and direction; e.g., harder, softer, descriptions of "which way").
- Students describe how the observations they make connect to the purpose of the investigation, including how the observations of the effects on object motion allow causal relationships between pushes and pulls and object motion to be determined.

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Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

</td></tr>
</table>

Grade K SCIENCE

<table>
<tr><th colspan="2">Physical Sciences</th><th>K.PS2.A.2</th></tr>
<tr><td>Core Idea</td><td colspan="2">Motion and Stability: Forces and Interactions</td></tr>
<tr><td>Component</td><td colspan="2">Forces and Motion</td></tr>
<tr><td>MLS</td><td colspan="2">Describe ways to change the motion of an object (i.e., how to cause an object to go slower, go faster, go farther, change direction, stop).</td></tr>
<tr><td colspan="2" rowspan="2"><u>Expectation Unwrapped</u>

<u>SCIENCE AND ENGINEERING PRACTICES</u>
• Collect observational data on the motion of objects.
• Analyze observational data and categorize what made an object’s motion change (i.e., go slower, go faster, go farther, change direction, stop).

<u>DISCIPLINARY CORE IDEAS</u>
Forces and Motion
• Describe the ways we can cause an object to change motion.

<u>CROSSCUTTING CONCEPTS</u>
• Describe the effect of actions on an object to make it change motion (i.e., go slower, go faster, go farther, change direction, stop) and generalize the relationship between the force applied and resulting motion of an object.</td><td><u>DOK Ceiling</u>
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<tr><td><u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• Limit observational data to qualitative measurements that may include nonstandard length but do not include precise measurement of distance or speed.
• Limit investigation of pushes and pulls to using student strength. Specialized tools or materials should not be included.
• Tasks should not assess friction as a mechanism for change in speed.</td><td><u>Sample Stems</u></td></tr>
</table>

Possible Evidence	

• With guidance, students organize given information using graphical or visual displays (e.g., pictures, pictographs, drawings, written observations, tables, charts). The given information students organize includes the following:
  ○ The relative speed or direction of the object before a push or pull is applied (i.e., qualitative measures and expressions of speed and direction; e.g., faster, slower, descriptions of "which way")
  ○ The relative speed or direction of the object after a push or pull is applied
• Using their organization of the given information, students describe relative changes in the speed or direction of the object caused by pushes or pulls from the design solution.
• Students describe their ideas about how the push or pull from the design solution causes the change in the object's motion.
• Based on the relationships they observed in the data, students describe whether the push or pull from the design solution causes the intended change in speed or direction of motion of the object.	

Stimulus Materials Graphic organizers, diagrams, graphs, data tables, drawings	

Grade K SCIENCE

<table>
<tr><th colspan="2">Physical Sciences</th><th>K.PS3.A.1</th></tr>
<tr><td>Core Idea</td><td colspan="2">Energy</td></tr>
<tr><td>Component</td><td colspan="2">Definitions of Energy</td></tr>
<tr><td>MLS</td><td colspan="2">Make observations to determine the effect of sunlight on Earth’s surface.</td></tr>
<tr><td colspan="2" rowspan="2"><u>Expectation Unwrapped</u>

<u>SCIENCE AND ENGINEERING PRACTICES</u>
• Collect observational data using relative terms (e.g., warmer, hotter, colder, cooler, brighter, darker, lighter) on the effect of sunlight on Earth’s surface.

<u>DISCIPLINARY CORE IDEAS</u>
Definitions of Energy
• Recall that sunlight warms Earth’s surface and that more sunlight means more warmth (e.g., it is generally warmer in the day than at night).

<u>CROSSCUTTING CONCEPTS</u>
• Generalize that the shielding or reduction of direct sunlight will result in reducing the warming effect of sunlight and that, conversely, an increase in direct sunlight will result in increasing the warming effect.</td><td><u>DOK Ceiling</u>
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<tr><td><u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• When collecting data, use relative terms (e.g., warmer, hotter, colder, cooler, brighter, darker, lighter).
• Do not assess the reading of temperatures/thermometers.
• Do not assess Sun/Earth position, tilt, shadows, or seasons.
• Limit examples to natural Earth surfaces (e.g., sand, soil, rocks, water).</td><td><u>Sample Stems</u></td></tr>
</table>

Possible Evidence

- With guidance, students describe the purpose of the investigation, which includes determining the effect of sunlight on Earth materials by identifying patterns of relative warmth of materials in sunlight and shade (e.g., sand, soil, rocks, water).
- Based on the given investigation plan, students describe, with guidance, the evidence that will result from the investigation, including observations of the relative warmth of materials in the presence and absence of sunlight (i.e., qualitative measures of temperature; e.g., hotter, warmer, colder).
- According to the given investigation plan and with guidance, students collect and record data that will allow them to
  - compare the warmth of Earth materials placed in sunlight and the same Earth materials placed in shade.
  - identify patterns of relative warmth of materials in sunlight and in shade (i.e., qualitative measures of temperature; e.g., hotter, warmer, colder).
  - describe that sunlight warms Earth's surface.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade K SCIENCE

Physical Sciences		K.PS3.B.1
Core Idea	**Energy**	
Component	**Conservation of Energy and Energy Transfer**	
MLS	With prompting and support, use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.	

Expectation Unwrapped	**DOK Ceiling**
[Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.] **SCIENCE AND ENGINEERING PRACTICES** • Design and build a model device, using provided tools and materials, to reduce the warming effect of sunlight. • Generate and compare multiple solutions to the engineering challenge. **DISCIPLINARY CORE IDEAS** **Conservation of Energy and Energy Transfer** • Recall that sunlight warms Earth's surface. **CROSSCUTTING CONCEPTS** • Generalize that the shielding or reduction of direct sunlight will result in reducing the warming effect of sunlight and that, conversely, an increase in direct sunlight will result in increasing the warming effect.	3 **Item Format** Selected Response Constructed Response Technology Enhanced

Content Limits/Assessment Boundaries	**Sample Stems**
• Do not assess independently; students must have support. • Tools and materials should be limited to common classroom instruments (e.g., ruler, scissors, tape, glue, cardboard, boxes, craft sticks, construction paper).	

Possible Evidence	
• Using scientific knowledge to generate design solutions ○ Students use given scientific information about sunlight's warming effect on Earth's surface to collaboratively design and build a structure that reduces warming caused by the Sun. ○ Students describe why the structure is expected to reduce warming for a designated area by providing shade. ○ Students use only the given materials and tools when building the structure. ○ Students describe whether the structure meets the expectations in terms of cause (structure blocks sunlight) and effect (less warming of the surface). ○ Students can explain how the structure reduces the warming effect of sunlight and can articulate the concept that shade (blocked sunlight) reduces the warming effect of the sunlight.	
Stimulus Materials	
Graphic organizers, diagrams, graphs, data tables, drawings	

Grade K SCIENCE

Life Sciences		K.LS1.C.1
Core Idea	**From Molecules to Organisms: Structure and Processes**	
Component	**Organization for Matter and Energy Flow in Organisms**	
MLS	Use observations to describe patterns of what plants and animals (including humans) need to survive.	

Expectation Unwrapped

[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.]

SCIENCE AND ENGINEERING PRACTICES

- Collect observations and information on the needs of various plants and animals.
- Organize or classify collected observations into like survival categories (e.g., food sources, water sources, shelter, air).

DISCIPLINARY CORE IDEAS

Organization for Matter and Energy Flow in Organisms

- Understand the basic food source needs of animals.
- Understand that plants need water and light to live and grow.

CROSSCUTTING CONCEPTS

- Make a generalization about the similar needs of all plants and similar needs of all animals and describe that pattern in the natural world.

DOK Ceiling

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Item Format

Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- Focus on understanding basic energy flow needed for survival.
- Do not assess food chains, food webs, or ecosystems.
- Do not assess survival instincts, habitat characteristics, or animal adaptations.
- Emphasize regional plants and animals (e.g., beaver, deer, squirrel, bobcat, skunk, fox, fish, hawk, bear, snake, ants, owls, birds, trees, grasses, flowers).
- Do not assess animal classifications (e.g., herbivore, carnivore, omnivore).

Sample Stems

Possible Evidence	

• With guidance, students organize the given data from observations (firsthand or from media) using graphical displays (e.g., pictures, charts), including the following:
  ○ Different types of animals (including humans)
  ○ Data about the foods different animals eat
  ○ Data about animals' drinking water
  ○ Data about plants' need for water (e.g., observations of the effects on plants in a classroom or school when they are not watered, observations of natural areas that are very dry)
  ○ Data about plants' need for light (e.g., observations of the effects on plants in a classroom when they are kept in the dark for a long time; observations about the presence or absence of plants in very dark places, such as under rocks or porches)
• Students identify patterns in the organized data, including the following:
  ○ All animals eat food.
  ○ All animals drink water.
  ○ Plants cannot live or grow if there is no water.
  ○ Plants cannot live or grow if there is no light.
• Students describe that the patterns they identified in the data provide evidence of the following:
  ○ Plants need light and water to live and grow.
  ○ Animals need food and water to live and grow.
  ○ Animals get their food from plants, other animals, or both.	

Stimulus Materials	
Graphic organizers, diagrams, graphs, data tables, drawings	

Grade K SCIENCE

Earth and Space Sciences		K.ESS1.B.1
Core Idea	**Earth's Place in the Universe**	
Component	**Earth and the Solar System**	
MLS	Make observations during different seasons to relate the amount of daylight to the time of year.	

Expectation Unwrapped	DOK Ceiling
[Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] **SCIENCE AND ENGINEERING PRACTICES** • Collect and analyze observations (data points). • Interpret data to make generalizations about seasons and amount of daylight in Missouri. **DISCIPLINARY CORE IDEAS** **Earth and the Solar System** • Recall that different seasons result in longer or shorter amounts of daylight, depending on the time of year ("Have you noticed that you can play outside longer in the summer than in the winter?") and describe those amounts in relative terms (e.g., more, few, less). **CROSSCUTTING CONCEPTS** • Describe the observable pattern that can be seen between the seasons and the amount of daylight.	2 **Item Format** Selected Response Constructed Response Technology Enhanced

Content Limits/Assessment Boundaries	Sample Stems
• Collected data may be provided or students can collect data with guidance and assistance. • Do not assess Earth's orbit, Earth's axis tilt, or Earth's placement in relation to the Sun throughout the year. • Do not assess "weather" within the season. • Limit amount of time to qualitative terms (e.g., longer, shorter, more, fewer, less). • Limit patterns of change to broad, generalized terms that highlight the extremes.	

Possible Evidence	
• Recall that the amount of daylight in a given day is more or less dependent on the time of year (season). • Interpret basic graphical displays (e.g., drawings, pictographs, symbols, manipulatives) showing amount of sunlight in each season. • Recognize that the general pattern of more or less daylight on a given day can be predicted based on the season.	
Stimulus Materials	
Graphic organizers, diagrams, graphs, data tables, drawings	

Grade K SCIENCE

Earth and Space Sciences		K.ESS2.D.1
Core Idea	**Earth's Systems**	
Component	**Weather and Climate**	
MLS	Use and share observations of local weather conditions to describe patterns over time.	

Expectation Unwrapped	**DOK Ceiling**
[Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and 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 and the number of sunny days versus cloudy days in different month.] **SCIENCE AND ENGINEERING PRACTICES** • Analyze observations (data points). **DISCIPLINARY CORE IDEAS** **Weather and Climate** • Make relevant local weather observations that include noticing the amount of sunlight, wind, snow/rain, and temperature, both throughout a day and/or across multiple days. **CROSSCUTTING CONCEPTS** • Identify general patterns in the local weather data collected over a period of time.	3 **Item Format** Selected Response Constructed Response Technology Enhanced

Content Limits/Assessment Boundaries	**Sample Stems**
• Limit assessment to patterns over time not to exceed a month. • Assessment of quantitative observations limited to whole numbers. • Do not assess "seasons" or what causes different seasons (tilt, revolution, etc.). • Patterns to be described in qualitative terms (i.e., sunny, cloudy, rainy, warm, cool, hot, cold).	

Possible Evidence

- With guidance, students organize data from given observations (firsthand or from media) about local weather conditions using graphical displays (e.g., pictures, charts). The weather condition data include the following:
  - The number of sunny, cloudy, rainy, windy, cool, or warm days
  - The relative temperature at various times of the day (e.g., cooler in the morning, warmer during the day, cooler at night)
- Students identify local weather conditions by describing them in relative terms of condition and temperature (e.g., sunny, snowy, cloudy, rainy, windy, cold, cool, warm, hot).
- Students identify and describe patterns in the organized data, including the following:
  - The relative number of days of different types of weather conditions in a month
  - The change in the relative temperature over the course of a day

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade K SCIENCE

<table>
<tr><th colspan="2">Earth and Space Sciences</th><th>K.ESS2.E.1</th></tr>
<tr><td>Core Idea</td><td colspan="2">Earth’s Systems</td></tr>
<tr><td>Component</td><td colspan="2">Biogeology</td></tr>
<tr><td>MLS</td><td colspan="2">With prompting and support, construct an argument using evidence for how plants and animals (including but not limited to humans) can change the environment to meet their needs.</td></tr>
<tr><td colspan="2" rowspan="2"><u>Expectation Unwrapped</u>

<u>SCIENCE AND ENGINEERING PRACTICES</u>
• Engage in an argument.
• Use relative evidence to support a claim.

<u>DISCIPLINARY CORE IDEAS</u>
Biogeology
• Describe how plants and animals change their environment (e.g., squirrel digs in the ground, ants build anthills).
• Identify ways humans have altered the natural environment and recognize how plants and animals have changed the environment to meet their needs (e.g., tree roots break concrete, vines grow around fences, birds use some human-made materials to build nests).

<u>CROSSCUTTING CONCEPTS</u>
• Describe the relationship (system) between plants and animals and their environment (natural or human-made).</td><td><u>DOK Ceiling</u>
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<tr><td><u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• Address physical and observable changes only.
• Environments shall include a variety of “natural” (e.g., stream, Missouri forest, prairie) and “human-made” (e.g., city street, farm, park, garden) areas.
• Student engages in argument when provided a scenario (prompting).
• Do not assess ecosystems; rather, focus on an individual plant’s or animal’s relationship to the environment.</td><td><u>Sample Stems</u></td></tr>
</table>

Possible Evidence	

• Students make a claim about a phenomenon and provide support for the claim. In their claim, students include the idea that plants and animals (including humans) can change the environment to meet their needs.
• Students identify and describe the given evidence to support the claim, including the following:
  ○ Examples of plants changing their environments (e.g., plant roots lifting sidewalks)
  ○ Examples of animals (including humans) changing their environments (e.g., ants building an anthill, humans clearing land to build houses, birds building a nest, squirrels digging holes to hide food)
  ○ Examples of plant and animal needs (e.g., shelter, food, room to grow)
• Students describe how the examples do or do not support the claim.
• Students support the claim and present an argument by logically connecting various needs of plants and animals to evidence about how plants/animals change their environments to meet their needs.	

Stimulus Materials	
Graphic organizers, diagrams, graphs, data tables, drawings	

Grade K SCIENCE

<table>
<tr><th colspan="2">Earth and Space Sciences</th><th>K.ESS3.A.1</th></tr>
<tr><td>Core Idea</td><td colspan="2">Earth and Human Activity</td></tr>
<tr><td>Component</td><td colspan="2">Natural Resources</td></tr>
<tr><td>MLS</td><td colspan="2">Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.</td></tr>
<tr><td colspan="2" rowspan="2"><u>Expectation Unwrapped</u>

<u>SCIENCE AND ENGINEERING PRACTICES</u>
• Use a model.
• Relate a model to relationships in nature.

<u>DISCIPLINARY CORE IDEAS</u>
Natural Resources
• Describe the needs of living things, both plants and animals (including humans).
• Identify that living things use their environment to meet their needs.
• Understand that humans use natural resources daily.

<u>CROSSCUTTING CONCEPTS</u>
• Identify the mutual relationship between living things and their natural environment (i.e., deer eat buds and leaves and are therefore often found in forest, grasses need sun and are therefore often found in meadows).</td><td><u>DOK Ceiling</u>
3</td></tr>
<tr><td><u>Item Format</u>
Selected Response
Constructed Response
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<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• Emphasis should be on regional (Missouri) environments such as streams, lakes, forests, prairies/meadows.
• Do not assess food chains or food webs at this point.</td><td><u>Sample Stems</u></td></tr>
</table>

Possible Evidence	
• From the given model (e.g., representation, diagram, drawing, physical replica, diorama, dramatization, storyboard) of a phenomenon involving the needs of living things and their environments, students identify and describe the components that are relevant to their representations, including the following: ○ Different plants and animals (including humans) ○ The places where the different plants and animals live ○ The things that plants and animals need (e.g., water, air, and land resources such as wood, soil, and rocks) • Students use the given model to represent and describe relationships between the components, including the following: ○ The relationships between the different plants and animals and the materials they need to survive (e.g., fish need water to swim, deer need buds and leaves to eat, plants need water and sunlight to grow) ○ The relationships between places where different plants and animals live and the resources those places provide ○ The relationships between specific plants and animals and where they live (e.g., fish live in water environments, deer live in forests where there are buds and leaves, rabbits live in fields and woods where there is grass to eat and space for burrows for homes, plants live in sunny and moist areas, humans get resources from nature [e.g., building materials from trees to help them live where they want to live]) • Students use the given model to describe that plants and animals, the places in which they live, and the resources found in those places are each part of a system and that these parts of systems work together and allow living things to meet their needs.	
Stimulus Materials Graphic organizers, diagrams, graphs, data tables, drawings	

Grade K SCIENCE

Earth and Space Sciences		K.ESS3.C.1
Core Idea	**Earth and Human Activity**	
Component	**Human Impacts on Earth's System**	
MLS	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.	

Expectation Unwrapped

SCIENCE AND ENGINEERING PRACTICES
- Communicate solutions with others in oral and/or written forms, using models and/or drawings that provide detail about scientific ideas.

DISCIPLINARY CORE IDEAS
Human Impacts on Earth's System
- Understand that humans impact the world around them.
- Create sketches, drawings, or physical models to communicate ideas for a problem's solutions.
- Identify ways to reduce human impact on land, water, air, and other living things.

CROSSCUTTING CONCEPTS
- Identify the impact of human choices on the environment and the general observable patterns that are formed.

DOK Ceiling
3

Item Format
Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- May collaboratively display solutions with others in oral and/or written forms, using models and/or drawings that provide detail about scientific ideas.
- Emphasis shall be on regional (Missouri) environmental issues that would be familiar to kindergarten students (e.g., littering, water waste, recycling, reusing, water pollution).
- Do not assess climate change or weather phenomena.

Sample Stems

Possible Evidence

- With guidance, students communicate observations using graphical or visual displays (e.g., pictures, pictographs, drawings, written observations, tables, charts). The observations students communicate includes solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
- Students communicate information about solutions that reduce the negative effects of humans on the local environment, including the following:
    - Examples of things that people do to live comfortably and how those things can cause changes to the land, water, air, and/or living things in the local environment
    - Examples of choices that people can make to reduce negative impacts and the effect those choices have on the local environment
- Students communicate the information about solutions with others in oral and/or written form, including using models and/or drawings.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade K SCIENCE

Engineering, Technology, and Application of Science		K.ETS1.A.1
Core Idea	**Engineering Design**	
Component	**Defining and Delimiting Engineering Problems**	
MLS	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.	

Expectation Unwrapped	**DOK Ceiling**
	3
	Item Format
	Selected Response Constructed Response Technology Enhanced

CLARIFICATION: Engineering Standards should be ongoing and continually integrated into science lessons/units. The ETS standards are written as a K-2 grade span end point. Therefore, by the end of grade 2, students should be proficient in these skills. In kindergarten, this engineering standard will be most successful when paired with, but not limited to the following standard:

K.PS2.A.1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes or pulls on the motion of an object.

SCIENCE AND ENGINEERING PRACTICES
- Ask questions based on observations to find more information about the natural and/or designed worlds.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

DISCIPLINARY CORE IDEAS
Defining and Delimiting Engineering Problems
- Before beginning to design a solution, it is important to clearly understand the problem.
- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problems.

CROSSCUTTING CONCEPTS
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Every human made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

Grade K SCIENCE

Content Limits/Assessment Boundaries	Sample Stems
• Tasks should provide students with a situation or simple problem to be changed or improved. • Constraints and limitations of the problem to be solved should be provided for the students. • K–2 tasks must be built on prior knowledge and experiences from the classroom and/or real world. • Tasks may ask students to identify key features of an improved object or tool.	
Possible Evidence	

• Students ask questions and make observations to gather information about a situation that people want to change.
• Students' questions, observations, and information-gathering are focused on the following:
  ○ A given simple situation that needs to change
  ○ Why a given situation needs to change
  ○ The desired outcome of changing a situation
• Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.
 	
ELA/Literacy
 	
• Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
• With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.
• Recall information from experiences or gather information from provided sources to answer a question.
• 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.
 	
Mathematics
 	
• 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, take-apart, and compare problems using information presented in a bar graph.	

Stimulus Materials Graphic organizers, diagrams, graphs, data tables, drawings	

Grade K SCIENCE

Engineering, Technology, and Application of Science		K.ETS1.B.1
Core Idea	**Engineering Design**	
Component	**Developing Possible Solutions**	
MLS	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.	

Expectation Unwrapped	**DOK Ceiling**
	3

Expectation Unwrapped

CLARIFICATION: Engineering Standards should be ongoing and continually integrated into science lessons/units. The ETS standards are written as a K-2 grade span end point. Therefore, by the end of grade 2, students should be proficient in these skills. In kindergarten, this engineering standard will be most successful when paired with, but not limited to the following standard:

K.ESS3.B.1: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

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.

DISCIPLINARY CORE IDEAS
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.

CROSSCUTTING CONCEPTS
Structure and Function
- The shape and stability of structures of natural and designed objects are related to their function(s).

DOK Ceiling
3

Item Format
Selected Response
Constructed Response
Technology Enhanced

Grade K SCIENCE

<table>
<tr><th>Content Limits/Assessment Boundaries</th><th>Sample Stems</th></tr>
<tr><td>

- Tasks should provide students with a scenario or simple problem to be solved.
- Constraints and limitations of the problem to be solved should be provided for the students.
- Modeling in K–2 must be built on prior knowledge and experiences from the classroom.
- Revisions of models is not appropriate for K–2.
- Tasks may ask students to identify key features of an improved object or tool.

</td><td rowspan="5"></td></tr>
<tr><td>Possible Evidence</td></tr>
<tr><td>

- Develop a model of an object and the problem it is intended to solve (formative/rubric).
- Identify structures and describe how they help perform a function to solve a given problem.
- Describe the relationships between the components of the model of the object that allow for the problem to be solved.
- Compare two models to identify which model better demonstrates how structure and function solve the problem.
- Match drawings, sketches, or models to pair structure with corresponding function.
- Draw or diagram a model that demonstrates a solution to a problem.
- Create a physical model (formative/rubric).

</td></tr>
<tr><td>Stimulus Materials</td></tr>
<tr><td>Graphic organizers, diagrams, graphs, data tables, drawings</td></tr>
</table>

Grade K SCIENCE

<table>
<tr><th colspan="2">Engineering, Technology, and Application of Science</th><th>K.ETS1.C.1</th></tr>
<tr><td>Core Idea</td><td colspan="2">Engineering Design</td></tr>
<tr><td>Component</td><td colspan="2">Optimizing the Solution Process</td></tr>
<tr><td>MLS</td><td colspan="2">Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.</td></tr>
<tr><td colspan="2"><u>Expectation Unwrapped</u>

<u>CLARIFICATION:</u> Engineering Standards should be ongoing and continually integrated into science lessons/units. The ETS standards are written as a K-2 grade span end point. Therefore, by the end of grade 2, students should be proficient in these skills. In kindergarten, this engineering standard will be most successful when paired with, but not limited to the following standard:

K.PSS.3.B.1: With prompting and support, use tools and materials to design and build a structure that will reduce the warming effect of sunlight.

<u>SCIENCE AND ENGINEERING PRACTICES</u>
Analyze Data
• Analyze data from tests of an object or tool to determine whether it works as intended.
• Record information (observations, thoughts, and ideas).
• Use and share pictures, drawings, and/or writings of observations.
• Compare predictions (based on prior experiences) to what occurred (observable events).

<u>DISCIPLINARY CORE IDEAS</u>
Optimizing the Design Solution
• Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

<u>CROSSCUTTING CONCEPTS</u>
Cause and Effect
• Simple tests can be designed to gather evidence to support or refute student ideas about causes.
• Structure and Function: The shape and stability of structures and designed objects are related to their function(s).</td><td><u>DOK Ceiling</u>
3

<u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
</table>

Content Limits/Assessment Boundaries	Sample Stems
• K–2 tasks must be built on prior knowledge and experiences from the classroom and/or real world. • Students must analyze data that they collected, not from another source. • Students are not required to demonstrate proficiency of this standard independently.	
Possible Evidence	

• With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
• Students use their organization of the data to find patterns in the data, including how each of the objects performed, relative to (1) the other object and (2) the intended performance.
• Students will describe how various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength).
• Students use the patterns they found in object performance to describe:
  ○ The way (e.g., physical process, qualities of the solution) each object will solve the problem
  ○ The strengths and weaknesses of each design
  ○ The object that is better suited to the desired function (if both objects solve the problem)
 	
ELA/Literacy
• With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.
• Recall information from experiences or gather information from provided sources to answer a question.
 	
Mathematics
• 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, take-apart, and compare problems using information presented in a bar graph.	

Stimulus Materials	
Graphic organizers, diagrams, graphs, data tables, drawings	