SUPPORT DOCUMENTS FOR THE GRADE 1 SOUTH CAROLINA ACADEMIC STANDARDS AND PERFORMANCE INDICATORS FOR SCIENCE



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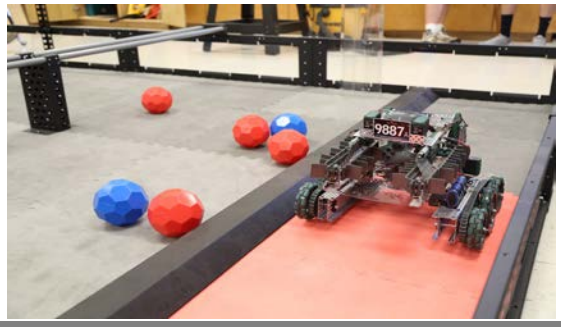

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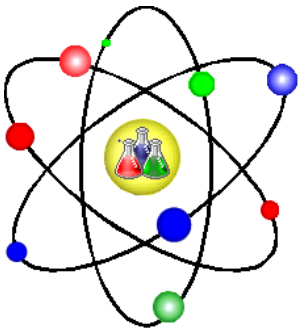

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SOUTH CAROLINA DEPARTMENT OF EDUCATION

The explication of the standards and performance indicators included in this document were developed under the direction of Dr. Cindy Van Buren, Deputy Superintendent, Division of School Effectiveness, Dr. Briana Timmerman, Director, Office of Instructional Practices and Evaluations, and Cathy Jones Stork, Team Leader, Office of Instructional Practices and Evaluations.

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INTRODUCTION

Local districts, schools and teachers may use this document to construct standards-based science curriculum, allowing them to add or expand topics they feel are important and to organize content to fit their students' needs and match available instructional materials. The support document includes essential knowledge, extended knowledge, connections to previous and future knowledge, and assessment recommendations. Educators may use a feedback form until October 31, 2014 to constructively critique this document and suggest resources and instructional strategies for each performance indicator (see pg. 9).

ACADEMIC STANDARDS

In accordance with the South Carolina Education Accountability Act of 1998 (S.C. Code Ann. § 59-18-110), the purpose of academic standards is to provide the basis for the development of local curricula and statewide assessment. Consensually developed academic standards describe for each grade and high school core area the specific areas of student learning that are considered the most important for proficiency in the discipline at the particular level.

Operating procedures for the review and revision of all South Carolina academic standards were jointly developed by staff at the State Department of Education (SCDE) and the Education Oversight Committee (EOC). According to these procedures, a field review of the first draft of the revised South Carolina science standards was conducted from March through May 2013. Feedback from that review and input from the SCDE and EOC review panels was considered and used to develop these standards.

The academic standards in this document are not sequenced for instruction and do not prescribe classroom activities; materials; or instructional strategies, approaches, or practices. The *South Carolina Academic Standards and Performance Indicators for Science* is not a curriculum.

STATEWIDE ASSESSMENT

The science standards and performance indicators for grades four through eight will be used as the basis for the development and/or refinement of questions on the South Carolina Palmetto Assessment of State Standards (SC-PASS) in science. The SC-PASS is based on the broad standards that address the life, earth, and physical science core content at each grade level. Test questions will measure the practice and/or the core content of the performance indicator. In addition, most performance indicators may be assessed with items that utilize any of the science and engineering practices. For example, an assessment item for a performance indicator that requires students to *construct explanations* may also ask students to use other practices such as *asking questions*, *using models*, or *analyzing data* around the core content in the original indicator. Items may also assess students' understanding of the core content without a science and engineering practice.

The high school course standards and performance indicators for Biology 1 will be used as the basis for the state-required End-of-Course Examination Program (EOCEP) for Biology 1.

GRADE 1 OVERVIEW

In kindergarten through grade two, the standards and performance indicators for the science and engineering practices and core science content emphasize students making observations and explanations about phenomena they can directly explore and investigate. Student experiences should be structured as they begin to learn the features of a scientific investigation and engage in the practices of science and engineering. The seven core concepts (patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change) are reinforced in the appropriate context of the core science content through hands-on instruction in the classroom.

These academic standards and performance indicators establish the practices and core content that South Carolina's students should know and be able to do by the end of grade one.

The four core areas of the grade one standards include:

- Exploring Light and Shadows
- Exploring the Sun and Moon
- Earth's Natural Resources
- Plants and Their Environments

The eight science and engineering practices describe how students should learn and demonstrate knowledge of the content outlined in the content standards. Engaging in these practices will help students become scientifically literate and astute consumers of scientific information.

Students should engage in scientific and engineering practices as a means to learn about the specific topics identified for their grade level. It is critical that educators understand the Science and Engineering Practices are ***not*** to be taught in isolation. There should ***not*** be a distinct "Inquiry" unit at the beginning of each school year. Rather, the practices need to be employed ***within the content*** for each grade level.

KINDERGARTEN

LIFE SCIENCE: EXPLORING ORGANISMS AND THE ENVIRONMENT

Standard K.L.2: The student will demonstrate an understanding of organisms found in the environment and how these organisms depend on the environment to meet those needs.

K.L.2A. Conceptual Understanding: The environment consists of many types of organisms including plants, animals, and fungi. Organisms depend on the land, water, and air to live and grow. Plants need water and light to make their own food. Fungi and animals cannot make their own food and get energy from other sources. Animals (including humans) use different body parts to obtain food and other resources needed to grow and survive. Organisms live in areas where their needs for air, water, nutrients, and shelter are met.

Performance Indicators: Students who demonstrate this understanding can:

K.L.2A.1 Obtain information to answer questions about different organisms found in the environment (such as plants, animals, or fungi).

K.L.2A.2 Conduct structured investigations to determine what plants need to live and grow (including water and light).

Figure 1: Example from the Kindergarten Curriculum Standards

The code assigned to each performance indicator within the standards is designed to provide information about the content of the indicator. For example, the **K.L.2A.1** indicator decodes as the following--

- **K: The first part of each indicator denotes the grade or subject.** The example indicator is from Kindergarten. The key for grade levels are as follows—

  K: Kindergarten
  1: First Grade
  2: Second Grade
  3: Third Grade
  4: Fourth Grade
  5: Fifth Grade
  6: Sixth Grade
  7: Seventh Grade
  8: Eighth Grade
  H.B: High School Biology 1
  H.C: High School Chemistry 1
  H.P: High School Physics 1
  H.E: High School Earth Science

- **L: After the grade or subject, the content area is denoted by an uppercase letter.** The L in the example indicator means that the content covers Life Science. The key for content areas are as follows—
  E: Earth Science
  EC: Ecology
  L: Life Science
  P: Physical Science
  S: Science and Engineering Practices

- **2: The number following the content area denotes the specific academic standard.** In the example, the 2 in the indicator means that it is within the second academic standard with the Kindergarten science content.

- **A: After the specific content standard, the conceptual understanding is denoted by an uppercase letter.** The conceptual understanding is a statement of the core idea for which students should demonstrate understanding. There may be more than one conceptual understanding per academic standard. The A in the example means that this is the first conceptual understanding for the standard.

- **1: The last part of the code denotes the number of the specific performance indicator.** Performance indicators are statements of what students can do to demonstrate knowledge of the conceptual understanding. The example discussed is the first performance indicator within the conceptual understanding.

FORMAT OF THE CURRICULUM SUPPORT DOCUMENT

The format of this document is designed to be structurally uniformed for each of the academic standards and performance indicators. For each, you will find the following sections--

- **Standard**
  - This section provides the standard being explicated.
- **Conceptual Understanding**
  - This section provides the overall understanding that the student should possess as related to the standard.
- **Performance Indicator**
  - This section provides a specific set of content with an associated science and engineering practice for which the student must demonstrate mastery.
- **Assessment Guidance**
  - This section provides guidelines for educators and assessors to check for student mastery of content utilizing interrelated science and engineering practices.
- **Previous and Future Knowledge**
  - This section provides a list of academic content along with the associated academic standard that students will have received in prior or will experience in future grade levels. Please note that the kindergarten curriculum support document does not

contain previous knowledge. Additionally, although the high school support document may not contain future knowledge, this section may list overlapping concepts from other high school science content areas.

- **Essential Knowledge**
  - This section illustrates the knowledge of the content contained in the performance indicator for which it is fundamental for students to demonstrate mastery. Mastery of the information in the Essential Knowledge section is measured by state-wide assessments in grades four-eight and high school biology 1.
- **Extended Knowledge**
  - This section provides educators with topics that will enrich students' knowledge related to topics learned with the explicated performance indicator.
- **Science and Engineering Practices**
  - This section lists the specific science and engineering practice that is paired with the content in the performance indicator. Educators should reference the chapter on this specific science and engineering practice in the *Science and Engineering Practices Support Guide.*

EVALUATING THE SUPPORT DOCUMENTS

As part of the development process, the SCDE would like to give the education community an opportunity to provide constructive feedback on the support documents including the grade/subject curriculum guides, 2005 to 2014 indicator crosswalks, and Science and Engineering Practices Guide. You may provide your comments or suggest curriculum resources by accessing the *Academic Standards and Performance Indicators for Science 2014 Support Document Feedback Form* which is available online—

https://adobeformscentral.com/?f=-fVAZrJqa9jZezpijXmmRg

You will be able to share only one comment per submission, but you may refresh the form to submit additional comments. The feedback form will close at noon on Oct. 31, 2014. If you have questions regarding this process, please contact Dr. Regina E. Wragg at 803-734-0564 or rwragg@ed.sc.gov.

GRADE 1 SCIENCE SUPPORT DOCUMENT

Standard

1.P.2: The student will demonstrate an understanding of the properties of light and how shadows are formed.

Conceptual Understanding

Objects can only be seen when light shines on them. Some materials allow light to pass through them; others allow only some light to pass through; and some do not allow any light to pass through and will create a shadow of the object. Technology such as mirrors can change the direction of a beam of light.

Performance Indicator

1.P.2A.1 Obtain and communicate information to describe how light is required to make objects visible.

Assessment Guidance

The objective of this indicator is to *obtain and communicate* information to describe how light is required to make objects visible. Therefore, the primary focus of assessment should be for students to *obtain informational texts, observations, data collected, or discussions to (1) generate and answer questions about the natural world, (2) understand phenomena, (3) develop models, or (4) support explanations* to describe how light allows us to see objects. This could include but is not limited to students obtaining information from a using a variety of informational texts (videos, non-fiction books, etc…) as well as conducting investigations using flashlights to view objects in a dark room and having a class discussion to describe how light is needed to make objects visible.

In addition to *obtain and communicate* information, students should *ask questions; plan and carry out investigations; analyze and interpret data; use mathematics and computational thinking; engage in argument from evidence; construct explanations; develop and use models; and construct devices or design solutions*.

Previous and Future Knowledge

- K.P.4 Observation
- 4.P.4 Light energy; Color; Reflection, refraction, absorption

Essential Knowledge

Basic properties of visible light:

- In order for an object to be visible, it must either give off its own light (be a source of light) or it must reflect light.
- If there is no light, then it is impossible to see an object.
- The Sun, a candle flame, or a flashlight gives off visible light.
- The Moon and many objects around us reflect light in order to be seen.

*SCIENTIFIC TOOLS used to describe how light is required to make objects visible include flashlights.

Extended Knowledge

- The intensity of light, or brightness, is related to the amount of light being seen. The closer the source of light is, the greater the brightness. “White light” is made up of many different colors. Objects absorb some light waves and reflect some light waves.

Science and Engineering Practices

S.1A.8

Standard

1.P.2: The student will demonstrate an understanding of the properties of light and how shadows are formed.

Conceptual Understanding

Objects can only be seen when light shines on them. Some materials allow light to pass through them; others allow only some light to pass through; and some do not allow any light to pass through and will create a shadow of the object. Technology such as mirrors can change the direction of a beam of light.

Performance Indicator

1.P.2A.2 Analyze and interpret data from observations to compare how light behaves when it shines on different materials.

Assessment Guidance

The objective of this indicator is to *analyze and interpret* data from observations to compare how light behaves when it shines on different materials. Therefore, the primary focus of assessment should be for students to *analyze and interpret data from observations, measurements, or investigations*, to understand patterns and meanings about how light behaves when it shines on different materials. This could include but is not limited to students using written observations and drawings from observations to compare how light behaves when passing through clear plastic (transparent), wax paper (translucent), and cardboard (opaque) materials.

In addition to *analyzing and interpreting* data, students should be asked to ask questions; plan and carry out investigations; use mathematics and computational thinking; engage in argument from evidence; construct explanations; develop and use models; obtain, evaluate, and communicate information; and construct devices or design solutions.

Previous and Future Knowledge

- K.P.4 Observable properties
- 2.P.3, 3.P.2 Properties of matter
- 4.P.4 Reflection, refraction, absorption; Transparent, translucent, opaque

Essential Knowledge

Light behaves differently when it strikes different types of materials.

Some materials allow light to pass through them.

- Objects can be seen clearly when viewed through materials that allow light to pass through.
- Air, glass, and water are examples of these materials.

Some materials allow only some light to pass through.

- Objects appear as blurry shapes when viewed through materials that only allow some light to pass through.
- Waxed paper and frosted glass are examples of materials that allow some light to pass through.

Some materials do not allow any light to pass through.

- Wood, metals, and cardboard are examples of materials that do not allow any light to pass through.

*SCIENTIFIC TOOLS used to compare how light behaves includes flashlights.

Extended Knowledge

• Students could use the terms transparent, translucent, or opaque as an extension of this knowledge.
Science and Engineering Practices S.1A.4

Standard

1.P.2: The student will demonstrate an understanding of the properties of light and how shadows are formed.

Conceptual Understanding

Objects can only be seen when light shines on them. Some materials allow light to pass through them; others allow only some light to pass through; and some do not allow any light to pass through and will create a shadow of the object. Technology such as mirrors can change the direction of a beam of light.

Performance Indicator

1.P.2A.3 Conduct structured investigations to answer questions about how shadows change when the position of the light source changes.

Assessment Guidance

The objective of this indicator is to *conduct structured investigations* to answer questions about how shadows change when the position of the light source changes. Therefore, the primary focus of assessment should be for students to *conduct structured investigations to answer scientific questions, test predictions and develop explanations: (1) predict possible outcomes, (2) identify materials and follow procedures, (3) use appropriate tools or instruments to make qualitative observations and take nonstandard measurements, and (4) record and represent data in an appropriate form while using appropriate safety procedures* to show that the position of the light source affects the size and location of a shadow. This could include but is not limited to students asking questions and making predictions about shadows and conducting structured investigations to determine how to make the shadow of an object larger and how to make the shadow move to a different location.

In addition to *conducting structured investigations,* students should *ask questions; analyze and interpret data; use mathematics and computational thinking; engage in argument from evidence; develop and use models; obtain, evaluate, and communicate information; and construct devices or design solutions*.

Previous and Future Knowledge

- K.P.4 Observable properties
- 4.P.4 Energy; Visible light; Brightness

Essential Knowledge

The position of a light source affects the appearance of a shadow. Shadows change size and location depending on the position of the light source.

Light travels in a straight line away from a light source until an object blocks it. When an object blocks light, the object casts a shadow.

- When the *distance* between the light source and an object changes, the *size* of the shadow changes
- When the *position* of the light source to the object changes, the *location* of the shadow changes.
- This can be observed over the course of a sunny day by measuring and observing the size and position of the shadows cast by objects outside.

***** NOTE: When conducting the structured investigations, students will discover how the position and location of the light source affects the shadow of an object. This information is included for

teacher reference during the facilitation of student discovery. Students should explore and discover the following:

- Shadows grow larger as the light source moves toward an object.
- Shadows grow smaller as the light source moves away from an object.
- When the light source shines down from directly above the object; there will be a very small shadow or no shadow at all. For example, when the Sun is directly overhead, trees cast short shadows or no shadow at all.
- Moving the light source up (from the bottom to the top) in front of an object causes the shadow to grow shorter.
- Moving the light source down (from the top to the bottom) in front of an object causes the shadow to grow taller.
- Moving the light source to the left causes the shadow to move to the right.
- Moving the light source to the right causes the shadow to moves to the left.

*****SCIENTIFIC TOOLS used to investigate shadows include flashlights**.**

Extended Knowledge

- The *shape* of the shadow of an object can change depending on the angle of the light source and the shape of the object. For example, a pumpkin with a stem will produce a round shadow if the light source is located near the bottom of the pumpkin. Moving the light source toward the top of the pumpkin will produce a shadow that is round and includes a stem.

Science and Engineering Practices
S.1A.3

Standard
1.P.2: The student will demonstrate an understanding of the properties of light and how shadows are formed.

Conceptual Understanding
Objects can only be seen when light shines on them. Some materials allow light to pass through them; others allow only some light to pass through; and some do not allow any light to pass through and will create a shadow of the object. Technology such as mirrors can change the direction of a beam of light.

Performance Indicator
1.P.2A.4 Develop and use models to describe what happens when light shines on mirrors based on observations and data collected.

Assessment Guidance
The objective of this indicator is to *develop and use models* to describe what happens when light shines on mirrors based on observations and data collected. Therefore, the primary focus of assessment should be for students to develop and use models to understand or represent phenomena, processes, and relationships and to communicate ideas to others to illustrate that light travels in a straight line and that mirrors can change the direction of a beam of light. This could include but is not limited to students conducting investigations with flashlights and mirrors in order to develop a diagram that illustrates how a beam of light can be redirected toward a given direction by using mirrors.

In addition to *developing and using models*, students should be asked to ask questions; plan and carry out investigations; analyze and interpret data; use mathematics and computational thinking; engage in argument from evidence; construct explanations; obtain, evaluate, and communicate information; and construct devices or design solutions.

Previous and Future Knowledge
- K.P.4 Types of materials
- 3.P.3 Types of energy
- 4.P.4 Reflection

Essential Knowledge
Light travels in a straight line away from the light source. Mirrors can change the direction of a beam of light.
Mirrors
- A *mirror* (plane/flat) is a tool that reflects light.
- Mirrors can be used to redirect light toward a given direction.
- *Mirrors* can also be used to see around corners and behind you.

Reflection
- When light strikes a mirror, it is reflected.
- When light is *reflected*, it bounces back from a surface.
- When light bounces off a mirror, the direction of the light changes.

*NOTE: A mirror is a tool that can be used to reflect light. However, all visible objects reflect some light. Students may have misconceptions that only mirrors or shiny objects reflect light.
*SCIENTIFIC TOOLS that can be used to investigate what happens when light shines on

mirrors include mirrors and flashlights.
Extended Knowledge • Images reflected in a mirror are different from the actual object. Mirror images are actually reversals of the image. • Curved mirrors can be used to magnify or reduce the size of images reflected by them.
Science and Engineering Practices S.1A.2

Standard
1.E.3: The student will demonstrate an understanding of the patterns of the Sun and the Moon and the Sun's effect on Earth.

Conceptual Understanding
1.E.3A: Objects in the sky move in predictable patterns. Some objects are better seen in the day sky and some are better seen in the night sky. The Sun is a star that provides heat and light energy for Earth.

Performance Indicator
1.E.3A.1: Use, analyze, and interpret data from observations to describe and predict seasonal patterns of sunrise and sunset.

Assessment Guidance
The objective of this indicator is to *analyze and interpret data* from observations to describe and predict seasonal patterns of sunrise and sunset. Therefore, the primary focus of assessment should be for students to analyze and interpret data from observations of the seasonal patterns of sunrise and sunset, determining that Earth rotates, causing the Sun to appear to rise and set. This could include but is not limited to students creating an observation journal including what is seen during day sky to describe and predict the seasonal patterns of sunset and sunrise.

In addition to *analyzing and interpreting data*, students should *ask questions; develop and use models; plan and carryout investigations; use mathematical and computational thinking; engage in scientific argument from evidence; construct explanations; obtain, evaluate, and communicate information; construct devices or design solutions*

Previous and Future Knowledge
There have been no previous standards or indicators pertaining to this standard and/or indicator.

- 4.E.3B Sun-Moon-Earth seasons
- 8.E.4B.3 Explain how seasons, caused by the tilt of the earth's axis as it orbits the sun, affects the length of day.
- 8.E.4B.4 Sun-Earth-Moon system cause Earth phenomena

Essential Understanding

- It is essential for students to know that the Earth turns (rotates) and the Sun appear to rise and set.
- The Sun appears to move across the sky during the day. It is lower in the sky in the morning (sunrise) and in the evening (sunset).
- Day sky: The day sky is when there is enough light from the Sun to see. Examples of features found in the day sky might include the Sun, the moon, clouds, birds, or airplanes.
- The Sun is the only star seen in the day sky.

Extended Knowledge

- Sunrise and sunset do not occur at the same times during the year and do not occur at the same times at other locations in the world.

Science and Engineering Practices
S.1A.4

Standard
1.E.3: The student will demonstrate an understanding of the patterns of the Sun and the Moon and the Sun's effect on Earth.

Conceptual Understanding
1.E.3A: Objects in the sky move in predictable patterns. Some objects are better seen in the day sky and some are better seen in the night sky. The Sun is a star that provides heat and light energy for Earth.

Performance Indicator
1.E.3A.2: Use data from personal observations to describe, predict, and develop models to exemplify how the appearance of the Moon changes over time in a predictable pattern

Assessment Guidance
The objective of this indicator is to use data from personal observations to *develop models* to show how the Moon changes over time in a predictable pattern. Therefore the primary focus of assessment should be for students to use observational data to create a model to illustrate the patterns of the moon. This could include but is not limited to using models to communicate information as it pertains to the appearance of the moon as it changes over time in a predictable pattern.

In addition to *developing and using models*, students should *ask questions, plan and carryout investigations; analyze and interpret data; use mathematical and computational thinking; engage in scientific argument from evidence; construct explanations obtain, evaluate, and communicate information; construct devices or design solutions.*

Previous and Future Knowledge
There have been no previous standards or indicators pertaining to this standard and/or indicator.

- 4.E.3A.3 Sun-Moon-Earth seasons
- 8.E.4B.1 characteristics and movements of objects in the solar system
- 8.E.4B.4 Motions within the Sun-Earth-Moon system cause Earth phenomena

Essential Understanding

- The Moon's appearance changes over time.
- The Moon is a ball of rock that moves around Earth.
- The Moon goes around earth about once every month.
- The Moon does not make its own light.
- The Moon can be seen because the sun's light shines on it.
- As the Moon moves around Earth, it appears to change shape. For example, we can see the entire Moon, part of the Moon, or none of the Moon.
- The appearance of the Moon changes shape in a regular pattern each month

Extended Knowledge

- Create a moon calendar and record patterns over a month's time.
- Research and write facts about the moon.
- Create a chart showing phases of the moon.

Science and Engineering Practices
S.1A.2

Standard
1.E.3: The student will demonstrate an understanding of the patterns of the Sun and the Moon and the Sun's effect on Earth.

Conceptual Understanding
1.E.3A: Objects in the sky move in predictable patterns. Some objects are better seen in the day sky and some are better seen in the night sky. The Sun is a star that provides heat and light energy for Earth.

Performance Indicator
1.E.3A.3: Obtain and communicate information to describe how technology has enabled the study of the Sun, the Moon, planets, and stars.

Assessment Guidance
The objective of this indicator is to *obtain and evaluate observations and data collected* to support explanations about the sun, moon, planets, and stars. Communicate observations and explanations using oral and written language. Therefore the primary focus of assessment should be for students to obtain and communicate information to describe how technology has enabled the study of the sun, moon, planets, and stars. This includes but is not limited to generating and answering scientific questions using sources of information and communicating the scientific information in an appropriate manner (orally, written, visually, and/or mathematically).

In addition to *developing and using models*, students should *ask questions; plan and carryout investigations; analyze and interpret data; use mathematical and computational thinking; engage in argument from evidence*; *construct explanations, develop and use models; construct devices or design solutions.*

Previous and Future Knowledge
There have been no previous standards or indicators pertaining to this standard and/or indicator.

- 8.E.4B.5 describe how data from technologies provide information about objects in the solar system

Essential Understanding

- Powerful telescopes can be used to learn about the sun, moon, planets, and stars.
- Man-made satellites are machines that are launched by rockets into space and are used by scientist to study the sun, moon, planets, and stars.
- Some man-made satellites take pictures of the sun, moon, planets, and stars.

Extended Knowledge

- Satellites come in many shapes and sizes.
- They contain two basic parts; an antennae and a power source

Science and Engineering Practices
S.1A.8

Standard

1.E.3: The student will demonstrate an understanding of the patterns of the Sun and the Moon and the Sun's effect on Earth.

Conceptual Understanding

1.E.3A: Objects in the sky move in predictable patterns. Some objects are better seen in the day sky and some are better seen in the night sky. The Sun is a star that provides heat and light energy for Earth.

Performance Indicator

1.E.3A.4: Conduct structured investigations to answer questions about the effect of sunlight on Earth's surface.

Assessment Guidance

The objective of this indicator is to *conduct structured investigations to answer questions* about the effect of sunlight on the Earth's surface. Therefore the primary focus of assessment should be for students to conduct structured investigations to answer specific questions and develop explanations using appropriate tools to make qualitative measurements about how the sun affects the Earth's surface. This includes but is not limited to a structured investigation based on questions generated about the Sun's heat and light energy and the affects it has on Earth's surfaces (i.e., land and water.)

In addition to *conducting structured investigations and asking questions,* students should *analyze and interpret data, use mathematical and computational thinking, engage in argument from evidence, construct explanations, develop and use models, obtain, evaluate, and communicate information; construct devices or design solutions.*

Previous and Future Knowledge

- There have been no previous standards or indicators pertaining to this standard and/or indicator.
- 6.E.2B.3 Solar energy and convection impact Earth's weather patterns and climate conditions -

Essential Understanding

The Sun is a star in the daytime sky that provides energy in the form of heat and light.

- The heat from the Sun provides warmth for Earth's surfaces.
- Without the Sun, Earth would be too cold to live on.
- Plants need the light from the Sun so that they can make their own food.
- To measure the effects of sun's heat on earth's materials. For example: soil (warmth soil enables growth for plants) and water.

Extended Knowledge

- Conduct structured investigations to answer questions about three different areas and try to determine the effect of sunlight on that particular areas

Science and Engineering Practices

S.1A.3

Standard
1.E.3: The student will demonstrate an understanding of the patterns of the Sun and the Moon and the Sun's effect on Earth.

Conceptual Understanding
1.E.3A: Objects in the sky move in predictable patterns. Some objects are better seen in the day sky and some are better seen in the night sky. The Sun is a star that provides heat and light energy for Earth.

Performance Indicator
1.E.3A.5: Define problems related to the warming effect of sunlight and design possible solutions to reduce its impact on a particular area

Assessment Guidance
The objective of this indicator is to *construct devices or design a solution* to reduce the impact of the warming effect of sunlight on a particular area. Therefore, the primary focus of assessment should be to solve specific problems or needs relating to the warming effect of sunlight. Students should ask questions to identify the problem, generate and communicate ideas for possible solutions, test solutions, determine if the solutions solved the problem and communicate their results. This includes but is not limited to designing a solution to help reduce the effects of global warming, and then testing some of their solutions.

In addition to *obtaining, evaluating, and communicating information,* students should *ask questions; plan and carryout investigations; analyze and interpret data; use mathematical and computational thinking; engage in argument from evidence; construct explanations; develop and use models; construct devices or design solutions.*

Previous and Future Knowledge
- There have been no previous standards or indicators pertaining to this standard and/or indicator.
- 2.E.2A.1 Sunlight and temperature
- 4.E.2B.1 4.E.2B.3 Climate conditions

Essential Understanding
The sun provides warmth and light to Earth's surfaces. If an area is shielded from the sun, the temperature effect will be less.

Extended Knowledge
- Test solutions and redesign solutions based on test results.

Science and Engineering Practices
S.1B.1

Standard 1.E.4: The student will demonstrate an understanding of the properties and uses of Earth's natural resources.

Conceptual Understanding 1.E.4A: Earth is made of different materials, including rocks, sand, soil, and water. An Earth material is a resource that comes from Earth. Earth materials can be classified by their observable properties

Performance Indicator 1.E.4A.1: Analyze and interpret data from observations and measurements to compare the properties of Earth materials (including rocks, soils, sand, and water).

Assessment Guidance

The objective of this indicator is to *analyze and interpret data* from observations and measurements to compare the properties of Earth materials (including rocks, soils, sand, and water). Therefore, the primary focus of assessment should be for students to *analyze and interpret data* from informational texts, or *perform investigations* using a range of methods (such as tabulation or graphing) to reveal patterns and construct meaning, or support hypotheses, explanations, claims, or designs. This could include, but is not limited to students collecting different Earth materials, including rocks, soil, sand and water, and comparing and contrasting their findings. Furthermore, students could analyze their data findings and draw illustrations in their journal and write their detailed observations of each.

In addition to *analyzing and interpreting data,* students should *ask questions*; *develop and use models; plan and carryout investigations; use mathematical and computational thinking; engage in scientific argument from evidence; construct explanations; obtain, evaluate, and communicate information; construct devices or design solutions.*

Previous and Future Knowledge

- 3.E.4 Rock, soil, landform
- 5.E.3 Landforms
- 8.E.5 Rock cycle, physical and chemical properties of minerals and ores
- 8.E.6 Fossils and rock layers
- H.E.3 Physical and chemical propertie3s of minerals and rocks, rock formation, components of soil

Essential Knowledge

Students need to know that Earth is made of different materials, including rocks, sand, soil, and water. An Earth material is defined as a resource that comes from Earth. Types of Earth materials include:

Rocks

- Rocks are hard, solid, nonliving materials that make up Earth.
- Rocks come in many different shapes, sizes, and colors and can be classified into different groups based on similar characteristics.
- Know that rocks and sand can be classified by their physical appearance.
- Examples of physical appearances used to classify rocks and sand might include color, size and shape, texture (rough or smooth), shiny or dull.

Sand

- Sand is made of tiny pieces of rock.

Soil

- Know that different soils have different properties. Soils can be sorted by color, texture, and

the capacity to nourish growing plants.

- Soil is the loose, top layer of Earth's surface made up of pieces of rock, sand, water, air, and pieces of dead organisms.
- The type of soil used the most for supporting life is the topsoil.
- Soil is used to grow plants.

Water

- Water is one of our most valuable resources on Earth.
- Every living thing needs water to survive.
- Water covers most of Earth, but only a small portion of it can be used for drinking.
- It can be salt water or fresh water.
- Water is a liquid that takes the shape of its container. For example, water on Earth may be found in containers known as lakes, ponds, or oceans.
- Water will flow downhill. Water flows in streams and rivers toward the ocean.
- Water feels wet. Water is needed by all living things.

Extended Knowledge

- Classification of rocks
- Layers of soil (soil profile)

Science and Engineering Practices:

S.1A.4

Standard 1.E.4: The student will demonstrate an understanding of the properties and uses of Earth's natural resources.

Conceptual Understanding 1.E.4A: Earth is made of different materials, including rocks, sand, soil, and water. An Earth material is a resource that comes from Earth. Earth materials can be classified by observable properties.

Performance Indicator 1.E4A.2: Develop and use models (such as drawings or maps) to describe patterns in the distribution of land and water on Earth and classify bodies of water (including oceans, rivers, stream, lakes, and ponds)

Assessment Guidance

The objective of this indicator is to *develop and use models* to understand the patterns in the distribution of land and water on Earth, and classify bodies of water, including oceans, rivers, streams, lakes and ponds. Therefore, the primary focus of assessment should be for students to understand the relationships between water and land on Earth. This could include, but is not limited to using information (obtained through research or investigations) to develop and construct a functional or descriptive model that represents the phenomenon. For example, creating a model to show the physical arrangement of a part of Earth, including both land and water.

In addition to *developing and using models*, students should *ask questions; plan and carryout investigations; analyze and interpret data; use mathematical and computational thinking; engage in scientific argument from evidence; construct explanations; obtain, evaluate, and communicate information; construct devices or design solutions.*

Previous and Future Knowledge

- 1.E.4 Ocean, rivers and streams
- 3.E.4 Composition of Earth's surface
- 5.E.3 Landforms, oceans
- 6.E.2 Ocean current
- H.E.6 Salt vs. Fresh water, water availability on Earth, quality of water, convection currents of ocean

Essential Knowledge

- Classify bodies of water as freshwater or saltwater
- Compare and contrast different bodies of water (oceans vs. lakes, rivers vs. ponds, etc.)

Extended Knowledge

- Estuaries, swamps, etc.
- Differentiate between different bodies of water

Science and Engineering Practices

S.1A.2

Standard

1.E.4: The student will demonstrate an understanding of the properties and uses of Earth's natural resources

Conceptual Understanding

1.E.4B: Natural resources are things that people use that come from Earth (such as land, water, air, and trees). Natural resources can be conserved.

Performance Indicator

1.E.4B.1: Obtain and communicate information to summarize how natural resources are used in different ways (such as soil and water to grow plants; rocks to make roads, walls, or buildings; or sand to make glass).

Assessment Guidance

The objective of this indicator is to *obtain and communicate information* to summarize how natural resources are used in different ways. Therefore, the primary focus of assessment should be for students to collect information on natural resources and summarize the ways the natural resources are used. This could include but is not limited to students researching ways to use natural resources and summarizing the information they collected through a presentation (oral or poster).

In addition to *obtaining and communicating information*, students should *ask questions; plan and carryout investigations; analyze and interpret data; use mathematical and computational thinking; engage in scientific argument from evidence; construct explanations; construct devices or design solutions.*

Previous and Future Knowledge

- 5.E.3, 8.E.5, H.E.3, H.E.5, H.E.6 Natural resources

Essential Knowledge

It is essential for students to know that Earth materials can be used for building structures or for growing plants. Examples of some ways that Earth materials can be used include:

Rocks Making roads, walls, or buildings

Sand Making glass, growing certain types of plants (for example a desert plant)

Soil Making bricks, growing certain types of plants (for example a forest plant)

Water Growing plants must take in water through their roots

But humans are not the only ones that use Earth materials. Birds use twigs, leaves, soil, and straw to make their homes and some insect homes are made from soil.

Extended Knowledge

- Types of specific Earth materials (for example granite, kaolin, slate).

Science and Engineering Practices

S.1.A.8

Standard 1.E.4: The student will demonstrate an understanding of the properties and uses of Earth's natural resources.

Conceptual Understanding 1.E.4B: Natural resources are things that people use that come from Earth (such as land, water, air, and trees). Natural resources can be conserved.

Performance Indicator 1.E.4B.2: Obtain and communicate information to explain ways natural resources can be conserved (such as reducing trash through, reuse, recycling, or replanting trees).

Assessment Guidance

The objective of this indicator is to *obtain and communicate information* to explain the use of natural resources that come from Earth. Therefore, the primary focus of assessment should be for students to be able to *communicate* how natural resources can be conserved through reducing trash, or replanting trees. This could include, but is not limited to understanding how to conserve natural resources, *generate and answer questions* related to conservation using above methods (or others), *develop models to support hypotheses, explanations, claims, or designs*. For example, students could *communicate observations and explanations of conservation* using the conventions and expectations of oral and written language using their journal.

In addition to *obtaining and communicating information*, students should *ask questions; develop and use models; plan and carryout investigations; analyze and interpret data; use mathematical and computational thinking; engage in scientific argument from evidence; construct explanations; construct devices or design solutions.*

Previous/Future Knowledge

- 5.E.3, 8.E.5, H.E.3, H.E.5, H.E.6 Natural resources
- 5.E.3, H.E.3, H.E.5 Human activity

Essential Knowledge

Students should have a firm understanding of what the terms "natural resources" and "conservation" mean. Students should be able to sort and classify objects as trash and recyclables (plastic, paper, glass, etc.) It is also important to know that replanting trees after they have been cut down is important in soil restoration and preservation. Replanting trees is also important to replenish a natural resource.

Extended Knowledge

- Students will classify resources as renewable or nonrenewable.
- Students will learn about the different ways to obtain energy (wind, solar, water), electric cars.

Science and Engineering Practices

S.1.A.8

Standard 1.L.5 The student will demonstrate an understanding of how the structures of plants help them survive and grow in their environments.

Conceptual Understanding 1.L.5A Plants have specific structures that help them survive, grow, and produce more plants. Plants have predictable characteristics at different stages of development.

Performance Indicator 1.L.5A.1 Obtain and communicate information to construct explanations for how different plant structures (including roots, stems, leaves, flowers, fruits, and seeds) help plants survive, grow, and produce more plants.

Assessment Guidance

The objective of this indicator is for students to *obtain and communicate information* to construct explanations for how different plant structures (including roots, stems, leaves, flowers, fruits, and seeds) help plants survive, grow, and produce more plants. Therefore, the primary focus of assessment should be for students to *obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, and communicate observations and explanations using oral and written language* about how specific plant structures help plants survive, grow, and produce more plants. Students should also communicate observations and explanations using oral and written language. This could include but is not limited to students making observations of specific parts of live plants and recording observations in science journals.

In addition to *obtaining and communicating information and constructing explanations*, students should *ask questions; plan and carry out investigations; analyze and interpret data; use mathematics and computational thinking; engage in argument from evidence; construct explanations; develop and use models*; and *construct devices or design solutions.*

Previous and Future Knowledge

- K.L.2A.2 Water, light
- 4.L.5A.1 Physical characteristics of plants (flowering and non-flowering) and animals (vertebrates and invertebrates)
- 4.L.5B.2 Structural adaptations of plants (roots, stems, leaves, flowers, fruit, seeds)

Essential Knowledge

There are different structures of plants (including roots, stems, leaves, flowers, fruits, and seeds). Each of these structures helps plants survive, grow, and produce more plants.

Stem - The part of the plant that grows out of the ground, supports the leaves, flowers, and fruit, and carries water from the roots to the rest of the plant

Root - The part of the plant that grows under the ground, holds the plant in place, and takes in water and nutrients from the ground

Leaf - The flat, usually green, part of the plant that grows from the stem and makes food for the plant

Flower - The part of the flowering plant that helps the plant make new plants like itself. It has

special characteristics, such as color or scent, which attracts insects and makes the seeds *Fruit* - The part of the flowering plant that grows from the flower and contains the seeds (Fruit forms around the seeds to protect them) *Seed* - The part of the flowering plant that will grow into a new plant; seeds are usually covered with a protective coating (seed coat)
Extended Knowledge Conduct structured investigations with teacher guidance to determine how plant structures help the plants survive, grow, and produce more plants
Science and Engineering Practices S.1A.8

Standard 1.L.5 The student will demonstrate an understanding of how the structures of plants help them survive and grow in their environments.

Conceptual Understanding 1.L.5A Plants have specific structures that help them survive, grow, and produce more plants. Plants have predictable characteristics at different stages of development.

Performance Indicator 1.L.5A.2 Construct explanations of the stages of development of a flowering plant as it grows from a seed using observations and measurements.

Assessment Guidance

The objective of this indicator is to *construct explanations* of the stages of development of a flowering plant as it grows from a seed using observations and measurements. Therefore, *the primary focus of assessment should be to construct explanations of phenomena using (1) student-generated observations and measurements, (2) results of scientific investigations, or (3) data communicated in graphs, tables, or diagrams to explain* the stages of development of a flowering plant. This could include but is not limited to students observing and recording measurements of plant growth (using standard whole units) over a structured period of time, organizing the data in a graph, table, or diagram, and constructing explanations of what occurs during each stage of development.

In addition to *constructing explanations,* students should *ask questions; plan and carry out investigations; analyze and interpret data; use mathematics and computational thinking; engage in argument from evidence; obtain, evaluate, and communicate information; develop and use models;* and *construct devices or design solutions.*

Previous and Future Knowledge

- K.L.2A.1 Organisms - plants, animals, fungi - food, water, air, shelter, space
- K.L.2A.2 Water, light
- 4.L.5A.2 Life cycle of plants

Essential Understanding

Plants have life cycles with distinct stages. A plant's life cycle describes the stages it goes through during its life, or how it germinates, grows, flowers, and makes seeds.

Germination

- The process in which a plant begins to sprout or grow from the seed

Growth

- The process of getting larger in size and developing from a seedling to a mature plant

Flowers

- the part of the plant that makes pollen
- flowers have to receive pollen to make seeds
- most flowers have special characteristics (color, scent) which attracts insects
- insects carry this pollen from flower to flower
- flowers make seeds deep inside

Seeds

- what flowering plants grow from
- contains the "baby" plant and the food it will need to grow

It is also essential for students to make observations (using the senses) and take measurements (in standard whole units) of a flowering plant to learn more about the plant's life cycle.

Extended Knowledge

Obtain and evaluate informational texts about the parts of a flower that make seeds, how seeds are produced, or reproduction from spores and communicate explanations using oral or written language.
Science and Engineering Practices S.1A.6

Standard 1.L.5 The student will demonstrate an understanding of how the structures of plants help them survive and grow in their environments.

Conceptual Understanding 1.L.5B Plants have basic needs that provide energy in order to grow and be healthy. Each plant has a specific environment where it can thrive. There are distinct environments in the world that support different types of plants. These environments can change slowly or quickly. Plants respond to these changes in different ways.

Performance Indicator 1.L.5B.1 Conduct structured investigations to answer questions about what plants need to live and grow (including air, water, sunlight, minerals, and space).

Assessment Guidance

The objective of this indicator is for students to *conduct structured investigations* to determine what plants need to live and grow. Therefore, the primary focus of assessment should be for students to *conduct structured investigations with teacher guidance to answer scientific questions, test predictions and develop explanations: (1) predict possible outcomes, (2) identify materials and follow procedures, (3) use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Students should also use appropriate safety procedures*. This could include but is not limited to conducting an investigation in which specific plant needs are withheld from live plants and recording the results of the investigation in a science journal.

In addition to *conducting structured investigations,* students should be asked *to ask questions; analyze and interpret data; use mathematics and computational thinking; engage in argument from evidence; construct explanations; develop and use models; obtain, evaluate, and communicate information;* and *construct devices or design solutions.*

Previous and Future Knowledge

- K.L.2A.2 Plants need water and light
- 4.L.5B.2 Structural adaptations that allow plants to survive and reproduce

Essential Knowledge

Plants have basic needs such as water and light in order to be able to make food. Plants then use the food to produce the energy needed in order to grow and make new plants like itself. The basic needs of a plant are:

Air

- Plants need air to make their own food and grow.

Water

- Plants need water to make their own food and grow.
- Too much water or too little water could cause the plant to die.

Sunlight

- Plants need sunlight to make their own food and grow.

Minerals

- Plants need minerals to help them grow and stay healthy.
- Minerals can be found in the soil or water.
- Just as with water, too many minerals or too few minerals could cause the plant to die.

Space

- Plants need a certain amount of space to grow.
- The space above the ground allows the plant to get the light and air it needs.

• The space below the ground allows the plant to get the water and minerals it needs through its roots. If there are too many plants in a particular area, the plant may not get the materials it needs to grow.
Science and Engineering Practices S.1A.3

Standard 1.L.5 The student will demonstrate an understanding of how the structures of plants help them survive and grow in their environments.

Conceptual Understanding 1.L.5B Plants have basic needs that provide energy in order to grow and be healthy. Each plant has a specific environment where it can thrive. There are distinct environments in the world that support different types of plants. These environments can change slowly or quickly. Plants respond to these changes in different ways.

Performance Indicator 1.L.5B.2 Develop and use models to compare how the different characteristics of plants help them survive in distinct environments (including deserts, forests, and grasslands).

Assessment Guidance

The objective of this indicator is to *develop and use models* to compare how the different characteristics of plants help them survive in distinct environments (including deserts, forests, and grasslands). Therefore the primary focus of assessment should be to *develop and use models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others* about the characteristics of plants that help them survive in distinct environments. This could include but is not limited to students developing models of different distinct environments and labeling and discussing specific plant parts that help them survive in each environment.

In addition to *developing and using models*, students should *ask questions; plan and carry out investigations; analyze and interpret data; use mathematics and computational thinking; engage in argument from evidence; construct explanations; obtain, evaluate, and communicate information*; and *construct devices or design solutions.*

Previous and Future Knowledge

- K.L.2A.6 Basic knowledge of plants

Essential Knowledge

There are different environments around the world that support different types of plants. Different characteristics of plants help them survive in distinct environments (including deserts, forests, and grasslands).

A distinct environment is a special surrounding that supports the life of different plants. Plants can survive only in environments in which their needs can be met. The world has many distinct environments that support varied types of plants.

Deserts

- Some desert plants store water in their stems or leaves.
- Other plants may have especially long roots that spread out to reach as much water as possible.
- Cacti (the plural form of cactus) are one of the best known desert plants. Cacti are designed to store water from one rainfall to the next.
- Cacti have needle-like leaves to keep in moisture and to keep predators away.

Forests

- Forests have many trees (with needles or with leaves), shrubs, and grasses.
- Some trees lose their leaves in the winter when it is cold and often dry. (These are deciduous trees.) By losing their leaves, they are able to conserve energy and water.

- Some trees have needle-like leaves with a waxy coating. This needle-like leaves help them hold in water and continue to make food in the winter.
- Some trees have thick bark to protect them from the cold.
- Many forest plants have large leaves so they can get plenty of sunlight.

Grasslands

- Grasses have long roots to soak up water deep in the ground. This also keeps animals from pulling out the roots when grazing.
- During a fire, the roots of many grasses survive so they can grow back quickly.
- Grasslands have many grasses that die every year. The grasses decay leaving nutrient-rich topsoil. Many grasses have flexible stems. This allows them to bend in the wind, instead of breaking.

Extended Knowledge

Characteristics of plant-life in other distinct environments not mentioned; additional characteristics of plant-life in these distinct environments.

Science and Engineering Practices

S.1A.2

Standard 1.L.5 The student will demonstrate an understanding of how the structures of plants help them survive and grow in their environments.

Conceptual Understanding 1.L.5B Plants have basic needs that provide energy in order to grow and be healthy. Each plant has a specific environment where it can thrive. There are distinct environments in the world that support different types of plants. These environments can change slowly or quickly. Plants respond to these changes in different ways.

Performance Indicator 1.L.5B.3 Analyze and interpret data from observations to describe how changes in the environment cause plants to respond in different ways (such as turning leaves toward the Sun, leaves changing color, leaves wilting, or trees shedding leaves).

Assessment Guidance

The objective of this indicator is to *analyze and interpret data* from observations to describe how changes in the environment cause plants to respond in different ways (such as turning leaves toward the Sun, leaves changing color, leaves wilting, or trees shedding leaves). Therefore the primary focus of assessment should be to *analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings* to describe how changes in the environment cause plants to respond in different ways. This could include but is not limited to students making and recording observations of the leaves on one particular tree over a structured time period (e.g. from late summer to early autumn) and then analyzing the data to determine how that particular plant responds to a decrease in the amount of sunlight.

In addition to *analyzing and interpreting data,* students should *ask questions; plan and carry out investigations; use mathematics and computational thinking; engage in argument from evidence; construct explanations; develop and use models; obtain, evaluate, and communicate information*; and *construct devices or design solutions.*

Previous Knowledge

This is students' first exposure to how plants respond to changes in the environment.

Essential Knowledge

Each type of plant has an environment in which it can thrive. An environment refers to the surroundings of living things (air, water, soil, plants, animals).

These environments can change slowly or quickly. Plants respond to these changes in different ways.

- Some plants have leaves that turn toward the Sun so they can get the most sunlight possible.
- Some plants have leaves that wilt when they get too hot or when the plant does not get enough water.
- In the autumn, some leaves change color. In winter, some trees shed their leaves.

Extended Knowledge

Additional plant responses to environmental changes such as too much rainfall, the lack of nutrients, or survival when animals are eating the plants.

Science and Engineering Practices

S.1A.4