**DEPT. OF EDUCATION AND   
EARLY DEVELOPMENT**



**Alaska Science GLEs to**

**Science Standards for Alaska Crosswalk**

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# Introduction

The Alaska Department of Education & Early Development, in coordination with science teachers from across the state, developed the Science Standards for Alaska (SSA) in 2019. This document catalogs the differences between the old Alaska Science Grade Level Expectations (GLEs) and the SSA to help facilitate the transition to the new standards.

The SSA are very different in structure and content from the old GLEs. They focus on Three Dimensional Learning in which students use the science and engineering practices and cross cutting concepts to learn about core ideas in science. In three dimensional learning students are actively engaged, use higher levels of thinking, follow and build on lines of reasoning, and incorporate the practices of science and engineering to figure out local phenomena and core ideas in science. When comparing the GLEs to the SSA, please note that each Performance Expectation, where listed, contains elements of the Practices, the Cross Cutting Concepts, and the Core Ideas. References to Alaska Standards for Culturally Responsive Schools allow a continuation of the commitment to recognizing the rich experiences Alaska students have to integrate different ways of knowing.

# List of abbreviations

PE: Performance Expectation

SEP: Science and Engineering Practices

DCI: Disciplinary Core Idea

CCC: Cross Cutting Concepts

NOS: Nature of Science

ETAS: Connections to Engineering, Technology, and Application of Science

ASCRS: Alaska Standards for Culturally Responsive Schools

# Science Grades 3-5

## A-1 Science as Inquiry and Process

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SA | *Students develop an understanding* of the processes and applications of scientific inquiry | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| SA1 | *Students develop an understanding* of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| SA2 | *Students develop an understanding* that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review. | NOS | Science Investigations Use a Variety of Methods.   * Science investigations are guided by a set of values to ensure accuracy of measurements, observations, and objectivity of findings.   Science Knowledge Is Based on Empirical Evidence   * Science disciplines share common rules of obtaining and evaluating empirical evidence.   Science Is a Human Endeavor   * Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. |
| SA3 | *Students develop an understanding* that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and that local applications provide opportunity for understanding scientific concepts and global issues. | ASCRS | D. Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. |

### Grade 3

The Science and Engineering Practices (SEP) are used throughout all units of study in Grade 3 to focus applications of scientific inquiry. These skills are embedded in the performance expectations in the Alaska Science Standards.

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 3SA1.1 | *The student demonstrates an understanding* of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating. | SEP | SEP #1, 3, 4, 6, 7, 8 |
| 3SA1.2 | *The student demonstrates an understanding* of the processes of science by observing and describing the student’s own world to answer simple questions. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 3SA2.1 | *The student demonstrates an understanding* of the attitudes and approaches to scientific inquiry by answering “how do you know?” questions with reasonable answers. | SEP | SEP #1, 3, 4, 5, 6, 8 |
| 3SA3.1 | *The student demonstrates an understanding* that interactions with the environment provide an opportunity for understanding scientific concepts by observing local conditions that determine which plants and/or animals survive. (L) | SEP  PE | SEP #7  3-LS4-3: Students who demonstrate understanding can: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. |

### Grade 4

The Science and Engineering Practices (SEP) are used throughout all units of study in Grade 4 to focus applications of scientific inquiry. These skills are embedded in the performance expectations in the Alaska Science Standards.

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 4SA1.1 | *The student demonstrates an understanding* of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating\* | SEP | SEP #1, 3, 4, 6, 7, 8 |
| 4SA1.2 | *The student demonstrates an understanding* of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate. | SEP | SEP #3, 8 |
| 4SA2.1 | *The student demonstrates an understanding* of the attitudes and approaches to scientific inquiry by supporting the student’s own ideas with observations and peer review. (L) | SEP | SEP #6, 7 |
| 4SA3.1 | *The student demonstrates an understanding* that interactions with the environment provide an opportunity for understanding scientific concepts by identifying the local limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive. (L) | SEP  PE | SEP #8  3-LS2-1: Construct an argument that some animals form groups that help members survive.  3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.  3-LS4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.  4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. |

### Grade 5

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 5SA1.1 | *The student demonstrates an understanding* of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating\*. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 5SA1.2 | *The student demonstrates an understanding* of the processes of science by using quantitative and qualitative observations to create inferences and predictions. | SEP | SEP #3, 4, 5, 6, 8 |
| 5SA2.1 | *The student demonstrates an understanding* of the attitudes and approaches to scientific inquiry by supporting the student’s own statements with facts from a variety of resources and by identifying their sources. (L) | SEP | SEP #7, 8 |
| 5SA3.1 | *The student demonstrates an understanding* that interactions with the environment provide an opportunity for understanding scientific concepts by identifying the limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive. | PE | 5-PS3-1: Use models to describe that energy in animals’ food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.  5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.  5-LS2-1: Develop and describe a model that describes the movement of matter among plants, animals, decomposers, and the environment. |

## B-1 Concepts of Physical Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SB | *Students develop an understanding* of the concepts, models, theories, universal principles, and facts that explain the physical world. | PE | Science Assumes an Order and Consistency in Natural Systems   * Science assumes consistent patterns in natural systems. |
| SB1 | *Students develop an understanding* of the characteristic properties of matter and the relationship of these properties to their structure and behavior. | PE | 5-PS1-1 Develop a model to describe that matter is made up of particles to small to be seen.  5-PS1-3 Make observations and measurements to identify materials based on their properties. |
| SB2 | *Students develop an understanding* that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved. | PE | 5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. |
| SB3 | *Students develop an understanding* of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems. | PE | 3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. |
| SB4 | *Students develop an understanding* of motions, forces, their characteristics and relationships, and natural forces and their effects. | PE | 5-PS2-2 Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion. |

### Grade 3

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 3SB1.1 | *The student demonstrates an understanding* of the structure and properties of matter by classifying matter according to physical properties (i.e., color, size, shape, weight, texture, flexibility). | PE | 2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. |
| 3SB2.1 | *The student demonstrates an understanding* of how energy can be transformed, transferred, and conserved by classifying materials as insulators or conductors (i.e., fur, metal, wood, plastic) and identifying their applications. | PE | K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.  K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.\*.  1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.  1-PS4-4: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.\*  4-PS3-1, 4-PS3-2, 4-PS3-3 - Definitions of Energy  4-PS3-2, 4-PS3-3 – Conservation of Energy and Energy Transfer |
| 3SB3.1 | *The student demonstrates an understanding* of the interactions between matter and energy and the effects of these interactions on systems by recognizing that temperature changes cause changes in phases of substances (e.g., ice changing to liquid, water changing to water vapor, and vice versa). | PE  DCI | 2-PS1-1:Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.  2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.  PS1.A: Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. |
| 3SB4.2 | *The student demonstrates an understanding* of motions, forces, their characteristics, relationships, and effects by recognizing that objects can be moved without being touched (e.g., using magnets, falling objects, static electricity). | PE | 3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.  3-PS2-2: Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion.  3-PS2-3: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. |

### Grade 4

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 4SB1.1 | *The student demonstrates an understanding* of the structure and properties of matter by identifying and comparing the characteristics of gases, liquids, and solids. | PE | 2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.  2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot |
| 4SB2.1 | *The student demonstrates an understanding* of how energy can be transformed, transferred, and conserved by investigating the effectiveness of different insulating and conducting materials with respect to heat flow and record the results (L). | PE | 4-PS3-1:Use evidence to construct an explanation relating the speed of an object to the energy of that object. |
| 4SB3.1 | *The student demonstrates an understanding* of the interactions between matter and energy and the effects of these interactions on systems by explaining that temperature changes cause changes in phases of substances (e.g., ice changing to liquid water and liquid water to water vapor). | PE | 4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. |
| 4SB4.1 | *The student demonstrates an understanding* of motions, forces, their characteristics, relationships, and effects by simulating that changes in speed or direction of motion are caused by forces (L). | PE | 4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide. |

### Grade 5

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 5SB1.1 | *The student demonstrates an understanding* of the structure and properties of matter by comparing models that represent matter as solids, liquids, or gases and the changes from one state to another (L). | SEP  DCI | SEP #2  PS1.A: Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. |
| 5SB2.1 | *The student demonstrates an understanding* of how energy can be transformed, transferred, and conserved by classifying the changes (i.e., heat, light, sound, and motion) that electrical energy undergoes in common household appliances (i.e., toaster, blender, radio, light bulb, heater). | PE | 4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. |
| 5SB3.1 | *The student demonstrates understanding* of the interactions between matter and energy and the effects of these interactions on systems by identifying physical and chemical changes based on observable characteristics (e.g., tearing paper vs. burning paper). | PE | 2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. |
| 5SB4.1 | *The student demonstrates an understanding* of motions, forces, their characteristics, relationships, and effects by investigating that the greater the force acting on an object, the greater the change in motion will be (L). | PE | 4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.  4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.  4-PS3-3*:* Ask questions and predict outcomes about the changes in energy that occur when objects collide.   4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.\* |

## C-1 Concepts of Life Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC | *Students develop an understanding* of the concepts, models, theories, facts, evidence, systems, and processes of life science. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| SC1 | *Students develop an understanding* of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution. | PE | 2-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. |
| SC2 | *Students develop an understanding* of the structure, function, behavior, development, life cycles, and diversity of living organisms. | PE | 4-LS1-1 Construct an argument that plants and animals have internal and external structures to support survival, growth, behavior, and reproduction. |
| SC3 | *Students develop an understanding* that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy. | PE | 3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. |

### Grade 3

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 3SC1.1 | *The student demonstrates an understanding of* how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by sorting Alaskan plants and/or animals using physical characteristics (e.g., leaves, beaks) (L). | PE | 3-LS4-1: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. |
| 3SC1.2 | *The student demonstrates an understanding* of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by describing how some traits (e.g., claws, teeth, camouflage) of living organisms have helped them survive as a species. | PE | 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. |
| 3SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by sorting animals and plants into groups based on appearance and behaviors. | PE | 3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment. |
| 3SC2.2 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by observing and comparing external features of plants and of animals that may help them grow, survive, and reproduce. | PE | 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. |
| 3SC3.1 | *The student demonstrates an understanding* *that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by identifying and sorting examples of living and non-living things in the local environment (L). | PE | 3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. |
| 3SC3.2 | *The student demonstrates an understanding* *that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by organizing a simple food chain of familiar plants and animals (L). | PE | 5-PS3-1: Use models to describe that energy in animals’ food (used  for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.  5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.  5-LS2-1: Develop and describe a model that describes the movement of matter among plants, animals, decomposers, and the environment. |

### Grade 4

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 4SC1.1 | *The student demonstrates an understanding* *of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution* by showing the relationship between physical characteristics of Alaskan organisms and the environment in which they live. | PE | 3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.  3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.\* |
| 4SC1.2 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution* by describing fossil evidence (e.g., casts, track ways, imprints, etc.) of extinct organisms. | PE | 3-LS4-1: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. |
| 4SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by choosing appropriate tools (i.e., hand lens, microscopes, ruler, balance) to examine the basic structural components (e.g., stems, leaves, fish scales, wings) of living things. | SEP | SEP #2, 3, 6, 7, 8 |
| 4SC2.2 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing the basic characteristics and requirements of living things. | PE | 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. |
| 4SC3.1 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by identifying examples of living and non-living things and the relationship between them (e.g., living things need water, herbivores need plants). | PE | K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive.  3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. |
| 4SC3.2 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by identifying a simple food chain of familiar plants and animals, diagramming how energy flows through it; describing the effects of removing one link. | PE | 5-PS3-1: Use models to describe that energy in animals’ food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.  5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water.  5-LS2-1: Develop and describe a model that describes the movement of matter among plants, animals, decomposers, and the environment. |

### Grade 5

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 5SC1.2 | *The student demonstrates an understanding* of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by making reasonable inferences about fossil organisms based on physical evidence. | PE | 3-LS4-1: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.  3- LS 4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. |
| 5SC2.1 | *The student demonstrates an understanding* of the structure, function, behavior, development, life cycles, and diversity of living organisms by identifying and sorting animals into groups using basic external and internal features. | PE | 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. |
| 5SC2.2 | *The student demonstrates an understanding* of the structure, function, behavior, development, life cycles, and diversity of living organisms by explaining how external features and internal systems (i.e., respiratory, excretory, skeletal, circulatory, and digestive) of plants and animals may help them grow, survive, and reproduce. |  | 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.  MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. |
| 5SC2.3 | *The student demonstrates an understanding* of the structure, function, behavior, development, life cycles, and diversity of living organisms by recognizing that organisms are composed of cells. | PE | 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.  MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. |
| 5SC3.1 | *The student demonstrates an understanding* that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by diagramming how matter and energy are transferred within and between living and nonliving things. | PE | 5-PS3-1: Use models to describe that energy in animals’ food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.  5-LS2-1: Develop and describe a model that describes the movement of matter among plants, animals, decomposers, and the environment. |
| 5SC3.2 | *The student demonstrates an understanding* that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by organizing a simple food chain of familiar plants and animals that traces the source of the energy back to sunlight. | PE | 5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from air and water. |

## D-1 Concepts of Earth Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD | *Students develop an understanding* of the concepts, processes, theories, models, evidence, and systems of earth and space sciences. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| SD1 | *Students develop an understanding* of Earth’s geochemical cycles. | PE | MS ESS2-1 Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process. |
| SD2 | *Students develop an understanding* of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth. | DCI | ESS1-C Local, regional, and global patterns of rock formations reveal changes over time due to Earth’s forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. |
| SD3 | *Students develop an understanding* of the cyclical changes controlled by energy from the sun and by Earth’s position and motion in our solar system. | PE | 5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, daily appearance of the moon, and the seasonal appearance of some stars in the night sky. |
| SD4 | *Students develop an understanding* of the theories regarding the evolution of the universe. | DCI | ESS1.A The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.  ESS1.B The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. |

### Grade 3

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 3SD3.1 | *The student demonstrates an understanding* of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by using recorded weather patterns (e.g., temperature, cloud cover, or precipitation) to make reasonable predictions (L). | PE | 3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.  3-ESS2-2: Obtain and combine information to describe climates in different regions of the world. |
| 3SD4.1 | *The student demonstrates an understanding* of the theories regarding the origin and evolution of the universe by recognizing that objects appear smaller the farther away they are. | PE | 5-ESS1-1: Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. |
| 3SD4.2 | *The student demonstrates an understanding* of the theories regarding the origin and evolution of the universe by recognizing that objects have properties, locations, and movements that can be observed and described. | PE | MS-ESS1-1a: Develop and use a model to explain how the positions of the Earth-Sun-Moon in a system and the cyclic patterns of each cause lunar phases and eclipses of the sun and moon.  MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. |
| 3SD4.3 | *The student demonstrates an understanding* of the theories regarding the origin and evolution of the universe by recognizing and using appropriate instruments of magnification (e.g., binoculars and telescopes) (L). | SEP | SEP #2, 3, 6, 7, 8 |

### Grade 4

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 4SD1.1 | *The student demonstrates an understanding* *of geochemical cycles* by describing that most smaller rocks come from the breaking and weathering of larger rocks as part of the rock cycle. | PE | 4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. |
| 4SD1.2 | *The student demonstrates an understanding* *of geochemical cycles* by recognizing the physical properties of water as they relate to the rock cycle. | PE | 4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. |
| 4SD2.1 | *The student demonstrates an understanding* *of* *the forces that shape Earth* by observing models of how waves, wind, water, and ice shape and reshape the Earth’s surface by eroding rock and soil (L). | PE | 4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. |
| 4SD2.2 | *The student demonstrates an understanding* *of* *the forces that shape Earth* by identifying causes (i.e., earthquakes, tsunamis, volcanoes, floods, landslides, and avalanches) of rapid changes on the surface | PE | 2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly. |
| 4SD3.1 | *The student demonstrates an understanding* *of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by recognizing changes to length of daylight over time and its relationship to seasons. | PE | 5-ESS1-2: Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, daily appearance of the moon, and the seasonal appearance of some stars in the night sky. |
| 4SD3.2 | *The student demonstrates an understanding* *of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by observing that heat flows from one object to another (L). | PE | 3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. |
| 4SD4.1 | *The student demonstrates an understanding* *of the theories regarding the origin and evolution of the universe* by recognizing that stars are like the sun but are so far away that they look like points of light. | PE | 5-ESS1-1: Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. |
| 4SD4.2 | *The student demonstrates an understanding* *of the theories regarding the origin and evolution of the universe* by recognizing that objects have properties, locations, and movements that can be observed and described.\* | PE | MS-ESS1-1a: Develop and use a model to explain how the positions of the Earth-Sun-Moon in a system and the cyclic patterns of each cause lunar phases and eclipses of the sun and moon.  MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. |

### Grade 5

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 5SD1.1 | *The student demonstrates an understanding* of geochemical cycles by observing a model of the rock cycle showing that smaller rocks come from the breaking and weathering of larger rocks and that smaller rocks (e.g., sediments and sands) may combine with plant materials to form soils (L). | PE | 4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. |
| 5SD2.1 | *The student demonstrates an understanding* of the forces that shape Earth by describing how wind and water tear down and build up the Earth’s surface resulting in new land formations (i.e., deltas, moraines, and canyons). | PE | 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere (water), cryosphere (ice), and/or atmosphere interact. |
| 5SD3.1 | *The student demonstrates an understanding* of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by observing a model that shows how the regular and predictable motion of the Earth and moon determine the apparent shape (phases) of the moon over time (L). | PE | 5-ESS1-2: Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, daily appearance of the moon, and the seasonal appearance of some stars in the night sky. |
| 5SD3.2 | *The student demonstrates an understanding* of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by comparing heat absorption and loss by land and water. | PE | K-PS3-1: Make observations to determine the effect of sunlight on Earth’s surface.  K-PS3-2: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.\*  3-ESS2-2: Obtain and combine information to describe climates in different regions of the world. |
| 5SD4.1 | *The student demonstrates an understanding* *of the theories regarding the origin and evolution of the universe* by distinguishing among stars, planets, moons, comets, and meteors (L). | PE | MS-ESS1-1a: Develop and use a model to explain how the positions of the Earth-Sun-Moon in a system and the cyclic patterns of each cause lunar phases and eclipses of the sun and moon.  MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.  MS-ESS1-3: Analyze data to determine scale properties of objects in the solar system. |
| 5SD4.2 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by recognizing that the Earth is in regular and predictable motion and this motion explains the length of a day and a year. | PE | 5-ESS1-2: Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, daily appearance of the moon, and the seasonal appearance of some stars in the night sky. |
| 5SD4.3 | *The student demonstrates an understanding* of the theories regarding the origin and evolution of the universe by recognizing and using appropriate instruments of magnification (e.g., binoculars and telescopes) (L). \* | SEP | SEP #2, 3, 6, 7, 8 |

## E-1 Science and Technology

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SE | *Students develop an understanding* of the relationships among science, technology, and society. | ETAS | Influence of Science, Engineering, and Technology on Society and the Natural World   * Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineering systems. |
| SE1 | *Students develop an understanding* of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events. | PE | 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. |
| SE2 | *Students develop an understanding* that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits. | PE | 3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. |
| SE3 | *Students develop an understanding* of how scientific discoveries and technological innovations affect and are affected by our lives and cultures. | NOS | Science Is a Human Endeavor   * Science affects everyday life. |

### Grade 3

Science and Engineering Practices are woven throughout the SSA, and include Engineering Technology and Applications of Science at each Grade Level and Grade Band.

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 3SE1.1 | *The student demonstrates an understanding* of how to integrate scientific knowledge and technology to address problems by identifying local problems and discussing solutions (L). | PE | 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. |
| 3SE2.1 | *The student demonstrates an understanding* that solving problems involves different ways of thinking, perspectives, and curiosity by identifying local tools and materials used in everyday life (L). | PE | 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. |
| 3SE3.1 | *The student demonstrates an understanding* of how scientific discoveries and technological innovations affect our lives and society by listing the positive and negative effects of a single technological development in the local community (e.g., fish trap, fish wheel, four-wheeler, computer) (L) | PE  DCI  ETAS | 3-5 ETS1.2 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.  ETS1.B: Developing Possible Solutions  Influence of Science, Engineering, and Technology on Society and the Natural World   * All human activity draws on natural resources and has both short- and long-term consequences, positive and negative, for the health of the people and the natural environment. |

### Grade 4

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 4SE1.1 | *The student demonstrates an understanding* of how to integrate scientific knowledge and technology to address problems by recognizing that tools (e.g., spear, hammer, hand lens, kayak, computer) and processes (e.g., drying fish, sewing, photography) are an important part of human cultures. | NOS | Scientific Investigations Use a Variety of Methods   * Science investigations use a variety of methods, tools, and techniques.   Science is a Way of Knowing   * Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge. |
| 4SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity by* identifying the function of a variety of tools (e.g., spear, hammer, hand lens, kayak, computer). | NOS  PE | Scientific Investigations Use a Variety of Methods   * Science investigations use a variety of methods, tools, and techniques.   3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. |
| 4SE2.2 | *The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity* by identifying multiple explanations (e.g., oral traditions, folklore, scientific theory) of everyday events (e.g., weather, seasonal changes) (L). | NOS | Science is a Human Endeavor   * People have practiced science for a long time   Science is a Way of Knowing   * Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge. |
| 4SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society* by listing the positive and negative effects of a scientific discovery. | CCC | Cross Cutting Concept 3-5-ETS1-1:   * Peoples’ needs and wants change over time, as do their demands for new and improved technologies. * Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. |

### Grade 5

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 5SE1.1 | *The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems* by identifying a community problem or issue and describing the information needed to develop a scientific solution (L). | PE | 3-5 ETS1.2 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. |
| 5SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity* byinvestigating a problem or project over a specified period of time and identifying the tools and processes used in that project (L). | PE  SEP | 3-5 ETS1.1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.  SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 5SE2.2 | *The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity* bycomparing multiple explanations (e.g., oral traditions, folklore, scientific theory) of everyday events (e.g., weather, seasonal changes) (L). | PE  NOS | 3-5 ETS1.2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.  Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena   * Science explanations describe the mechanisms for natural events. |
| 5SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society* by describing the various effects of an innovation (e.g., snow machines, airplanes, immunizations) on the safety, health, and environment of the local community (L). | NOS  ETAS | Interdependence of Science, Engineering and Technology   * Science and technology support each other. * Tools and instruments are used to answer scientific questions, while scientific discoveries lead to the development of new technologies.   Influence of Science, Engineering, and Technology on Society and the Natural World   * People’s needs and wants change over time, as do their demands for new and improved technologies. * Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. * When new technologies become available, they can bring about changes in the way people live and interact with one another. |

## F-1 Cultural, Social, Personal Perspectives, and Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SF | *Students develop an understanding* of the dynamic relationships among scientific, cultural, social, and personal perspectives. | ASCRS | B. Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life |
| SF1 | *Students develop an understanding* of the interrelationships among individuals, cultures, societies, science, and technology. | ASCRS | A. Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community. |
| SF2 | *Students develop an understanding* that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world. | ASCRS | E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. |
| SF3 | *Students develop an understanding* of the importance of recording and validating cultural knowledge. | ASCRS | D. Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. |

### Grade 3

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 3SF1.1-SF3.1 | *The student demonstrates an understanding* of the dynamic relationships among scientific, cultural, social, and personal perspectives by exploring local or traditional stories that explain a natural event (L). | NOS | Scientific Investigations Use a Variety of Methods   * Scientists use different ways to study the world |

### Grade 4

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 4SF1.1-SF3.1 | *The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives* by connecting observations of nature to a local or traditional story that explains a natural event (e.g., animal adaptation, weather, rapid changes to Earth’s surface) (L). | NOS | Scientific Knowledge Is Based on Empirical Knowledge   * Scientists look for patterns and order when making observations about the world. |

### Grade 5

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 5SF1.1-SF3.1 | *The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives* by telling a local or traditional story that explains a natural event (e.g., animal adaptation, weather, rapid changes to Earth’s surface) and relating it to a scientific explanation (L). \* | NOS | Scientific Knowledge Assumes and Order and Consistency in Natural Systems   * Science assumes consistent patterns in natural systems. |

## G-1 History and Nature of Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SG | *Students develop an understanding* of the history and nature of science. | NOS | Scientific Knowledge Is Based on Empirical Knowledge   * Scientists look for patterns and order when making observations about the world. |
| SG1 | *Students develop an understanding* that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge. | NOS | Science Assumes an Order and Consistency in Natural Systems   * Science assumes natural events happen today as they happened in the past. * Many events are repeated |
| SG2 | *Students develop an understanding* that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world. | ETAS | Interdependence of Science, Engineering, and Technology   * Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. |
| SG3 | *Students develop an understanding* that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s). | NOS | Science Knowledge is Open to Revision in Light of New Evidence   * Science explanations can change based on new evidence |
| SG4 | *Students develop an understanding* that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base. | NOS | Science Is a Human Endeavor   * Creativity and imagination are important to science. |

### Grade 3

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 3SG2.1 | *The student demonstrates an understanding* of the bases of the advancement of scientific knowledge by comparing the results of multiple observations of a single local event (L). | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 3SG4.1 | *The student demonstrates an understanding* that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by asking questions about the natural world. | SEP | SEP #1 |

### Grade 4

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 4SG2.1 | *The student demonstrates an understanding* of the bases of the advancement of scientific knowledge by recognizing the need for repeated measurements. | SEP | SEP #2, 3, 4, 5, 6, 7, 8 |
| 4SG4.1 | *The student demonstrates an understanding* that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by using an account of a discovery to recognize that an individual’s (e.g. George Washington Carver, Marie Curie) curiosity led to advancements in science. | NOS | Science is a Human Endeavor   * Men and women from all cultures and backgrounds choose careers as scientists and engineers * Most scientists and engineers work in teams. * Science affects everyday life. * Creativity and Imagination are important to science |

### Grade 5

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 5SG2.1 | *The student demonstrates an understanding* of the bases of the advancement of scientific knowledge by reviewing and recording results of investigations into the natural world. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 5SG4.1 | The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by investigating that scientists curiosity led to advancements in science. | NOS | Science Investigations Use a Variety of Methods   * Science methods are determined by questions. * Science investigations use a variety of methods, tools, and techniques.   Science Is a Way of Knowing   * Science is both a body of knowledge and processes that add new knowledge * Science is a way of knowing that is used by many people. |

# Science Grades 6-8

## A-1 Science as Inquiry and Process

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SA | Students develop an understanding of the processes and applications of scientific inquiry. | NOS | Scientific Investigations Use a Variety of Methods:   * Science investigations use a variety of methods and tools to make measurements and observations. * Science investigations are guided by a set of values to ensure accuracy of measurements, observations, and objectivity of findings. * Science depends on evaluating proposed explanations. * Scientific values function as criteria in distinguishing between science and non-science. |
| SA1 | Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| SA2 | Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review. | NOS | Science is a Human Endeavor:   * Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers. * Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination and creativity. * Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism and openness to new ideas. |
| SA3 | Students develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and that local applications provide opportunity for understanding scientific concepts and global issues. | NOS | Science is a Way of Knowing:   * Science is both a body of knowledge and the processes and practices used to add to that body of knowledge. * Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge. * Science is a way of knowing used by many people, not just scientists.   Science is a Human Endeavor:   * Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers. |

### Grade 6

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 6SA1.1 | *The student demonstrates an understanding* of *the processes of science* by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating. \* | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8  The Science and Engineering Practices (SEP) are used throughout all units of study in Grade 6 to focus applications of scientific inquiry and understanding how scientists work. These practices are embedded in the performance expectations in many of Alaska Science Standards. |
| 6SA1.2 | *The student demonstrates an understanding* of *the processes of science* by collaborating to design and conduct simple repeatable investigations (L). | SEP | SEP #3 |
| 6SA2.1 | *The student demonstrates an understanding* of the attitudes and approaches to scientific inquiry by identifying and differentiating fact from opinion. | SEP | SEP #7, 8 |
| 6SA3.1 | *The student demonstrates an understanding* that interactions with the environment provide an opportunity for understanding scientific concepts by gathering data to build a knowledge base that contributes to the development of questions about the local environment (e.g., moose browsing, trail usage, river erosion) (L). | SEP | SEP #1, 8  Questions about the local environment can be explored using science practices to explore local phenomena as a focus for learning disciplinary core ideas and cross cutting concepts. |

### Grade 7

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 7SA1.1 | *The student demonstrates an understanding of the processes of science* by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating. | SEP | SEP #1, 3, 4, 8 |
| 7SA1.2 | *The student demonstrates an understanding of the processes of science* by collaborating to design and conduct simple repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings (L). | SEP | SEP #3, 4, 6, 8 |
| 7SA2.1 | *The student demonstrates an understanding of the processes of science* by identifying and evaluating the sources used to support scientific statements. | SEP | SEP #8  Alaska English/Language Arts Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12 |
| 7SA3.1 | *The student demonstrates an understanding of the processes of science* by designing and conducting a simple investigation about the local environment. | SEP | SEP #3 |

### Grade 8

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 8SA1.1 | *The student demonstrates an understanding of the processes of science* by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8  The Science and Engineering Practices (SEP) are used throughout all units of study in Grade 8 to focus applications of scientific inquiry and understanding how scientists work. These practices are embedded in the performance expectations in many of Alaska Science Standards. |
| 8SA1.2 | *The student demonstrates an understanding of the processes of science* by collaborating to design and conduct repeatable investigations in order to record, analyze (i.e., range, mean, median, mode), interpret data, and pre sent findings. | SEP | SEP #3, 5 |
| 8SA2.1 | *The student demonstrates an understanding of the attitudes and approaches to scientific inquiry* by recognizing and analyzing differing scientific explanations and models. | SEP | SEP #2, 4, 6, 7. 8 |
| 8SA3.1 | *The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by conducting research to learn how the local environment is used* by a variety of competing interests (e.g., competition for habitat/resources, tourism, oil and mining companies, hunting groups). | PE | MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment  MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth’s systems. |

## B-1 Concepts of Physical Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SB | *Students develop an understanding of* the concepts, models, theories, universal principles, and facts that explain the physical world. | NOS | Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena:  Theories are explanations of observable phenomena.  Scientific theories are based on a body of evidence developed over time.  Laws are regularities or mathematical descriptions of natural phenomena. |
| SB1 | *Students develop an understanding of* the characteristic properties of matter and the relationship of these properties to their structure and behavior. | DCI | MS-PS1.A: Structure and Properties of Matter |
| SB2 | *Students develop an understanding* that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved. | DCI  PE | MS-PS3.A: Definitions of Energy  4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents |
| SB3 | *Students develop an understanding of* the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems. | DCI  PE | MS-PS3.A: Definitions of Energy  MS PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. |
| SB4 | *Students develop an understanding of* motions, forces, their characteristics and relationships, and natural forces and their effect. | DCI | MS-PS2.A: Forces and Motion  MS-PS2.B: Types of Interactions |

### Grade 6

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 6SB1.1 | *The student demonstrates an understanding* of how energy can be transformed, transferred, and conserved by recognizing that energy can exist in many forms (i.e., heat, light, chemical, electrical, mechanical). | DCI  PE | MS-PS3.B: Conservation of Energy and Energy Transfer  4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. |
| 6SB2.1 | *The student demonstrates an understanding* of the interactions between matter and energy and the effects of these interactions on systems by recognizing that most substances can exist as a solid, liquid, or gas depending on temperature. | DCI  PE | MS-PS1.A: Structures and properties of matter (from PE 2-PS1-1)  MS-PS1-4: Students who demonstrate understanding can: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. |
| 6SB3.1 | *The student demonstrates an understanding* of motions, forces, their characteristics, relationships, and effects by stating that every object exerts gravitational force on every other object. | PE | MS-PS-2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.  MS-PS2-5: Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. |
| 6SB4.2 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships and effects by* stating that every object exerts gravitational force on every other object. | DCI  PE | MS-PS 2.B: Types of interactions Gravitational forces are always attractive.  MS-PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. |
| 6SB4.3 | *The student demonstrates* *an understanding of motions, forces, their characteristics, relationships and effects by* making waves move through a variety of media. | PE | MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. |

### Grade 7

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 7SB1.1 | *The student demonstrates understanding of the structure and properties of matter* by using physical properties (i.e., density, boiling point, freezing point, conductivity) to differentiate among and/or separate materials (i.e., elements, compounds, and mixtures). | SEP  DCI  PE | SEP #3  MS-PS1.A: Structure of Matter  MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures  MSPS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state when thermal energy is added or removed. |
| 7SB2.1 | *The student demonstrates understanding of the structure and properties of matter* by explaining that energy (heat, light, chemical, electrical, mechanical) can change form. | SEP  DCI  PE | SEP #6  MS-PS3.A: Definitions of Energy  HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. |
| 7SB3.1 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by recognizing that most substances can exist as a solid, liquid, or gas depending on the motion of their particles. | DCI | MS-PS1.A: Structure of Matter |
| 7SB4.1 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by illustrating that unbalanced forces will cause an object to accelerate. | DCI  PE | MS-PS2.A: Forces and Motion  MS-PS2-2: Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object. |
| 7SB4.2 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by recognizing that electric currents and magnets can exert a force on each other. | DCI  PE | MS-PS2.B: Types of Interactions  MS-PS2-3: Ask questions about data to determine the factors that affect the strength of electrical and magnetic forces |
| 7SB4.3 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by recognizing that electric currents and magnets can exert a force on each other. | DCI  PE | MS-PS4.A: Wave Properties  MS-PS4-1: Qualitatively and quantitatively describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. |

### Grade 8

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 8SB1.1 | *The student demonstrates an understanding of the structure and properties of matter* by using physical and chemical properties (i.e., density, boiling point, freezing point, conductivity, flammability) to differentiate among materials (i.e., elements, compounds, and mixtures). | DCI | MS-PS1.A: Structure and Properties of Matter.  MS-PS1.B: Chemical Reactions  5-PS1.B: Chemical Reactions |
| 8SB2.1 | *The student demonstrates an understanding of how energy can be transformed, transferred, and conserved* by identifying the initial source and resulting change in forms of energy in common phenomena (e.g., sun to tree to wood to stove to cabin heat). | DCI  PE | MS-LS1.C: Organization for Matter and Energy Flow in Organisms  MS-LS2.B: Cycle of Matter and Energy Transfer in Ecosystems  MS-PS3.A: Definitions of Energy  HS-PS3.B: Conservation of Energy and Energy Transfer  MS-PS1-4: Develop a model that predicts and describes  MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and non-living parts of an ecosystem  HS-PS3-1: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. |
| 8SB3.1 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by exploring changes of state with increase or decrease of particle speed associated with heat transfer. | DCI  PE | MS-PS1.A: Structure and Properties of Matter  MS-PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. |
| 8SB3.2 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by exploring through a variety of models (e.g., gumdrops and toothpicks) how atoms may bond together into well defined molecules or bond together in large arrays. | SEP  DCI  PE | SEP #2  MS-PS1.A: Structure and Properties of Matter  MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures. |
| 8SB4.1 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by demonstrating and explaining circular motion. | DCI | MS-PS2.A: Forces and Motion |
| 8SB4.2 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by describing the interactions between charges. | DCI | MS-PS2.B: Types of Interactions |

## C-1 Concepts of Life Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC | Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science. | NOS | Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena:   * Theories are explanations of observable phenomena. * Scientific theories are based on a body of evidence developed over time. * Laws are regularities or mathematical descriptions of natural phenomena. |
| SC1 | Students develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution. | DCI | MS-LS3.A: LS3.A Inheritance of Traits  MS-LS4.A: Evidence of Common Ancestry and Diversity  MS-LS4.B: Natural Selection  MS-LS4.C: Adaptation |
| SC2 | Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms. | DCI | MS-LS4.D: Biodiversity and Humans  MS-LS1.B: Growth and Development of Organisms |
| SC3 | Students develop an understanding that all organisms are linked to each other and their physical environments. | DCI | MS-LS2.A: Interdependent Relationships in Ecosystems  MS-LS2.B: Cycle of Matter and Energy  MS-LS2.C: Ecosystem Dynamics, Functioning, and Resilience |

### Grade 6

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 6SC1.1 | *The student demonstrates an understanding* of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by recognizing sexual and asexual reproduction. | PE | MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. |
| 6SC1.2 | *The student demonstrates an understanding* of how science explains changes in life forms over time, recognizing that species survive by adapting to changes in their environment. | PE | MS-LS1-4: Use an evidence-based argument to support an explanation for how characteristic behaviors and/or structures of organisms affect the probability of their successful reproduction. |
| 6SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by using a dichotomous key to classify animals and plants into groups using external or internal features. | PE | 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction |
| 6SC2.2 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by identifying basic behaviors (e.g., migration, communication, hibernation) used by organisms to meet the requirements of life. | PE | MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.  MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. |
| 6SC2.3 | *The student demonstrates an understanding* of the structure, function, behavior, development, life cycles, and diversity of living organisms by describing the levels of organization within a human body (i.e., cells, tissues, organs, systems). | PE | MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.  MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.  MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. |
| 6SC3.1 | *The student demonstrates an understanding* that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by recognizing that organisms can cause physical and chemical changes (e.g., digestion, growth, respiration, photosynthesis) to matter and recognizing the importance of energy transfer in these changes. | PE | MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.  5-PS3-1: Use models to describe that energy in animals’ food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun. |
| 6SC3.2 | *The student demonstrates an understanding* that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by organizing a food web using familiar plants and animals. | PE | 5-LS2-1: Develop and describe a model that describes the movement of matter among plants, animals, decomposers, and the environment. |

### Grade 7

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC1.1 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by* comparing and contrasting sexual and asexual reproduction | SEP  DCI  PE | SEP #4  MS-LS1.B: Growth and Development of Organisms  MS-LS1-4: Use an evidence-based argument to support an explanation for how characteristic behaviors and/or structures of organisms affect the probability of their successful reproduction. |
| SC1.2 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by* describing possible outcomes of mutations (i.e. not effect, damage, benefit) | SEP  DCI | SEP #6  MS-LS3.B: Variation of Traits |
| SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing the basic structure and function of plant and animal cells | DCI  PE | MS-LS1.A: Structure and Function  MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells  MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function |
| SC2.2 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by identifying the seven levels of classification of organisms | DCI  PE | MS-LS1.A: Structure and Function  MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. |
| SC2.3 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by identifying and describing the functions of human organs (i.e. heart, lungs, brain) | DCI  PE | MS-LS1.A: Structure and Function  MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting sub-systems composed of groups of cells.  MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories |
| SC3.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by* recognizing and explaining that organisms can cause physical and chemical changes (e.g., digestion, growth, respiration, photosynthesis) to matter and recognizing and explaining the importance of energy transfer in these changes | DCI  PE | MS-LS1.C: Organization for Matter and Energy Flow in Organism:  MS-LS2.B: Cycle of Matter and Energy Transfer in Ecosystems  MS-PS3.D: Energy in Chemical Process and Everyday Life  MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.  MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.  MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and non-living parts of an ecosystem. |
| SC3.2 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by classifying organisms within a food web as producers, consumers, or decomposers. | SEP  DCI  PE | SEP #6  MS-LS2.A: Interdependent Relationships in Ecosystems  MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. |

### Grade 8

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC1.1 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process to natural selection, and biological evolution* by describing the role of genes in sexual re-production (i.e., traits of the off spring) | SEP  DCI  PE | SEP #6  MS-LS3.A: Inheritance of Traits  MS-LS3.B: Variation of Traits  MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. |
| SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by placing vertebrates into correct classes of taxonomy based on external, observable features | SEP  DCI  PE | SEP #4  MS-LS4.A: Evidence of Common Ancestry and Diversity  MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. |
| SC2.2 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by explaining that most organisms utilize inherited and learned behaviors to meet the basic requirements of life | SEP  DCI  PE | SEP #6  MS-LS1.D: Information Processing,  MS-LS1.B: Growth and Development of Organisms  MS-LS1-4: Use an evidence-based argument to support an explanation for how characteristic behaviors and/or structures of organisms affect the probability of their successful reproduction. |
| SC2.3 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing the functions and interdependence of human body systems (i.e., circulatory, respiratory, nervous) | SEP  DCI  PE | SEP #6  MS-LS1.A: Structure and Function  MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. |
| SC3.1 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by stating that energy flows and that matter cycles but is conserved within an ecosystem | SEP  DCI  PE | SEP #7  MS-LS1.C: Organization for Matter and Energy Flow in Organisms  MS-PS3.D: Energy in Chemical Processes and Everyday Life  MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. |
| SC3.2 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by organizing a food web that shows the cycling matter | SEP  DCI | SEP #2  MS-LS2.A: Interdependent Relationships in Ecosystems  MS-LS2.B: Cycle of Matter and Energy Transfer in Ecosystems |

## D-1 Concepts of Earth Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD | Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences. | NOS | Scientific knowledge is Open to Revision in Light of New Evidence:   * Scientific explanations are subject to revision and improvement in light of new evidence. * The certainty and durability of scientific findings vary.   Scientific Knowledge Assumes and Order and Consistency in Natural Systems:   * Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. * Science carefully considers and evaluates anomalies in data and evidence. |
| SD1 | Students develop an understanding of Earth’s geochemical cycles. | DCI | MS-ESS2-A: Earth’s Materials and Systems |
| SD2 | Students develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth. | DCI | MS-ESS1-C: The History of Planet Earth |
| SD3 | Students develop an understanding of the cyclical changes controlled by energy from the sun and by Earth’s position and motion in our solar system. | SEP  DCI | SEP #2  MS-ESS1-A: The Universe and Its Stars  MS-ESS1-B: Earth and Solar System |
| SD4 | Students develop an understanding of the theories regarding the evolution of the universe | NOS  DCI | Science Addresses Questions about the Natural and Material World:   * Science limits its explanations to systems that lend themselves to observation and empirical evidence.   MS-ESS1.B: Earth and the Solar System |

### Grade 6

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 6SD1.1 | *The student demonstrates an understanding of geochemical cycles by* exploring the rock cycle and its relationship to igneous, metamorphic, and sedimentary rocks. | PE | MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. |
| 6SD1.2 | *The student demonstrates an understanding of geochemical cycles by* identifying the physical properties of water within the stages of the water cycle | PE | MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. |
| 6SD2.1 | *The student demonstrates an understanding of the forces that shape Earth by* describing the formation and composition (i.e., sand, silt, clay, organics) of soils | PE | 4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.  MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. |
| 6SD2.2 | *The student demonstrates an understanding of the forces that shape Earth* by identifying and describing its layers (i.e., crust, mantle, core) | PE | 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere (water), cryosphere (ice), and/or atmosphere interact. |
| 6SD2.3 | *The student demonstrates an understanding* of the forces that shape Earth by describing how the surface can change rapidly as a result of geological activities (i.e., earthquakes, tsunamis, volcanoes, floods, landslides, avalanches) | PE | MS-ESS2-2: Construct and present an evidence-based explanation of how geoscience processes have changed Earth’s surface at varying time and spatial scales.  MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. |
| 6SD3.1 | *The student demonstrates an understanding* *of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by connecting the water cycle to weather phenomena | PE | 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere (water), cryosphere (ice), and/or atmosphere interact. |
| SD3.2 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by identifying that energy transfer is affected by surface conditions (e.g., snow cover, asphalt, vegetation) and that this affects weather |  | **Not expressly included.** |

### Grade 7

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD1.1 | *The student demonstrates an understanding of geochemical cycles* by describing the rock cycle and its relationship to igneous, metamorphic, and sedimentary rocks | SEP  DCI  PE | SEP #6  MS-ESS2.A: Earth’s Materials and Systems.  MS-ESS2-1: Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process. |
| SD1.2 | *The student demonstrates an understanding of geochemical cycles* by explaining the water cycle’s connection to changes in the Earth’s surface | SEP  DCI  PE | SEP #2, 6  MS-ESS2.C: The Role of Water in Earth’s Surface Processes  MS-ESS2-4: Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity. |
| SD2.1 | *The student demonstrates an understanding of the forces that shape Earth* by identifying strategies (e .g., reforestation, dikes, wind breaks, off road activity guidelines) for minimizing erosion. | SEP  DCI  PE | SEP #1, 6  MS-ESS2.C: Roles of Water in Earth’s Surface Processes  3-5-ESS2.A: Earth Materials and Systems  MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.  4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind or vegetation.  4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. |
| SD2.2 | *The student demonstrates an understanding of the forces that shape Earth* by describing how the movement of the tectonic plates results in both slow changes (e.g., formation of mountains, ocean floors, and basins) and short-term events (e .g., volcanic eruptions, seismic waves, and earthquakes) on the surface | SEP  DCI  PE | SEP #4, 6  MS-ESS2.B: Plate Tectonics and Large-Scale System Interactions  4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth’s features.  MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales.  MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions. |
| SD3.1 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by describing the weather using accepted meteorological terms (e .g., pressure systems, fronts, precipitation) | SEP  DCI  PE | SEP #6  MS-ESS2.C: Roles of Water in Earth’s Surface Processes  MS-ESS2.D: Weather and Climate  MS-ESS2-5: Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.  MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climate. |
| SD3.2 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by recognizing the relationship between phase changes (i.e., sublimation, condensation, evaporation) and energy transfer | SEP  DCI  PE | SEP #4  MS-PS1.A: Structure and Properties of Matter  MS-PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. |
| SD4.1 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by comparing and contrasting characteristics of planets and stars (i.e., light reflecting, light emitting, orbiting, orbited, composition) | SEP  DCI | SEP #4  MS-ESS1.A: The Universe and Its Stars  MS-ESS1.B: Earth and the Solar System |
| SD4.2 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by using light years to describe distances between objects in the universe | SEP  DCI  CCC | SEP #4  MS-ESS1.A: The Universe and Its Stars  MS-ESS1.B: Earth and the Solar System  Cross Cutting Concept MS-ESS1-3:   * Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. |

### Grade 8

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD1.1 | *The student demonstrates an understanding of geochemical cycles* by making connections between components of the locally observable geologic environment and the rock cycle | SEP  DCI | SEP #1  MS-ESS2.A: Earth’s Materials and Systems |
| SD1.2 | *The student demonstrates an understanding of geochemical cycles* by applying knowledge of the water cycle to explain changes in the Earth’s surface | SEP  DCI  PE | SEP #6  MS-ESS2.C: The Role of Water in Earth’s Surface Processes  MS-ESS2-4: Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity. |
| SD2.1 | *The student demonstrates an understanding of the forces that shape Earth* by interpreting topographical maps to identify feature s (i.e., rivers, lakes, mountains, valleys, islands, and tundra | SEP  DCI  PE | SEP #4  3-5-ESS2.B: Plate Tectonics and Large-Scale System Interactions  4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth’s features. |
| SD2.2 | *The student demonstrates an understanding of the forces that shape Earth* by using models to show the relationship between convection currents within the mantle and the large-scale movement of the surface. | SEP  DCI  PE | SEP #2  MS-ESS2.A: Earth’s Materials and Systems  MS-ESS2.B: Plate Tectonics and Large-Scale System Interactions  MS-ESS1.C: The History of Planet Earth  MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions. |
| SD3.1 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by recognizing the relationship between the seasons and Earth’s tilt relative to the sun and describing the day/night cycle as caused by the rotation of the Earth every 24 hours | SEP  DCI  PE | SEP #2  MS-ESS1.B: Earth and the Solar System  MS-ESS1-1b: Develop and use a model to explain how the seasons occur. |
| SD3.2 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by recognizing types of energy transfer (convection, conduction, and radiation) and how they affect weather | SEP  DCI  PE | SEP #2  MS-ESS2.D: Weather and Climate  MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. |
| SD4.1 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by creating models of the solar system illustrating size, location/position, composition, moons/rings, and conditions | SEP  DCI  PE | SEP #2  MS-ESS1.B: Earth and the Solar System  MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.  MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.  *Note: Portions of this GLE are expressly excluded at this grade level (see Assessment Boundary).* |
| SD4.2 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by comparing the brightness of a star to its distance and size | SEP  DCI  PE | SEP #4  3-5-ESS1.A: The Universe and its Stars  5-ESS1-1: Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth. |

## E-1 Science and Technology

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SE | Students develop an understanding of the relationships among science, technology, and society. | ETAS | Connections to Engineering, Technology, and Applications of Science:   * Interdependence of Science, Engineering, and Technology * Influence of Engineering, Technology, and Science on Society and the Natural World |
| SE1 | Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events. | NOS | Science Addresses Questions About the Natural and Material World |
| SE2 | Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits. | NOS | Science is a Human Endeavor |
| SE3 | Students develop an understanding of how scientific discoveries and technological innovations affect and are affectedby our lives and culture | NOS | Science is a Human Endeavor:   * Science and engineering are influenced by society and society is influenced by science and engineering. |

### Grade 6

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 6SE1.1 | *The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems* by recognizing that technology cannot always provide successful solutions for problems or fulfill every human need. | NOS | Influence of Engineering, Technology, and Science on Society and the World:   * Engineers continuously modify technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. * New technologies can have deep impacts on society and the environment, including some that were not anticipated. |
| 6SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking by identifying and designing a solution to a problem.* | PE | MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |
| 6SE2.2 | *The student demonstrates an understanding that solving problems involves different ways of thinking by comparing the student’s work to the work of peers in order to identify multiple paths that can be used to investigate a question or problem (L).* | SEP  NOS | SEP #3, 4, 6, 8  Scientific Knowledge is Open to Revision in Light of New Evidence:   * Science findings are frequently revised and/or reinterpreted based on new evidence. |
| 6SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by describing the various effects of an innovation on a global level.* | ETAS | Influence of Science, Engineering, and Technology on Society and the Natural World   * All human activity draws on natural resources and has both short and long- term consequences, positive as well a negative, for the health of people and the natural environment. |

### Grade 7

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 7SE1.1 | *The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by describing how public policy affects the student’s life (e.g. public waste disposal) (L).* | SEP | SEP #1, 8 |
| 7SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking by identifying, designing, testing, and revising solutions to a local problem (L).* | SEP  PE | SEP #1, 3, 6  MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |
| 7SE2.2 | *The student demonstrates an understanding that solving problems involves different ways of thinking by comparing the student’s work to the work of peers in order to identify multiple paths that can be used to investigate a question or problem.* | SEP  NOS | SEP #8  Scientific Investigations Use a Variety of Methods |
| 7SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by recognizing the effects of a past scientific discovery, invention, or scientific breakthrough (e .g., DDT, internal combustion engine).* | DCI | MS-ETS1.A: Defining and Delimiting an Engineering Problem  MS-ETS1.B: Developing a Possible Solution |

### Grade 8

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 8SE1.1 | *The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems* by describing how public policy affects the student’s life and participating diplomatically in evidence-based discussions relating to the student’s community | SEP | SEP #7, 8 |
| 8SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking* by identifying, designing, testing, and revising solutions to a local problem | SEP  PE | SEP #1, 3, 6  MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |
| 8SE2.2 | *The student demonstrates an understanding that solving problems involves different ways of thinking* by comparing the student’s work to the work of peers in order to identify multiple paths that can be used to investigate and evaluate potential solutions to a question or problem | SEP  NOS | SEP #8  Scientific Investigations Use a Variety of Methods |
| 8SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society* by predicting the possible effects of a recent scientific discovery, invention, or scientific breakthrough | NOS  ETAS | Science Addresses Questions About the Natural and Material World  Influence of Science, Engineering, and Technology on Society and the Natural World |

## F-1 Cultural, Social, Personal Perspectives, and Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SF | Students develop an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives. | NOS  ASCRS | Science is a Way of Knowing  B. Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life. |
| SF1 | Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology. | NOS  ASCRS | Science is a Human Endeavor  A. Culturally knowledgeable students dare well-grounded in the cultural heritage and traditions of their community. |
| SF2 | Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world. | ASCRS | E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. |
| SF3 | Students develop an understanding of the importance of recording and validating cultural knowledge | ASCRS | D. Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. |

### Grade 6

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 6SF1.1-SF3.1 | *The student demonstrates an understanding* of the dynamic relationships among scientific, cultural, social, and personal perspectives by telling a local or traditional story that explains a natural event (e.g. animal adaptation, weather, rapid changes to Earth’s surface) and relating it to a scientific explanation\* (L). | NOS | Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena   * Science explanations describe the mechanisms for natural events. |

### Grade 7

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 7SF1.1-SF3.1 | *The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives* by investigating the basis of local knowledge (e .g., describing and predicting weather) and sharing that information. | SEP  NOS | SEP #1  Science is a Way of Knowing:   * Science knowledge is cumulative and many people from many generations and nations have contributed to science knowledge. |

### Grade 8

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 8SF1.1-SF3.1 | *The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives* by describing how local knowledge, culture, and the technologies of various activities (e .g., hunting, fishing, subsistence) influence the development of scientific knowledge. | SEP  NOS | SEP # |

## G-1 History and Nature of Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SG | Students develop an understanding of the history and nature of science. | NOS | Scientific Knowledge Is Based on Empirical Knowledge   * Scientific knowledge is based on logical and conceptual connections between evidence and explanations. * Science disciplines share common rules of obtaining and evaluating empirical evidence. |
| SG1 | Students develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge. | NOS | Science Knowledge is Open to Revision in Light of New Evidence   * Scientific explanations are subject to revision and improvement in light of new evidence. * The certainty and durability of scientific findings vary. * Scientific findings are frequently revised and/or reinterpreted based on new evidence.   Science Assumes an Order and Consistency in Natural Systems   * Science carefully considers and evaluates anomalies in data and evidence. |
| SG2 | Students develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in, striving for the best possible explanations of the natural world. | ETAS | Interdependence of Science, Engineering, and Technology   * Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. |
| SG3 | Students develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s). | NOS | Science Knowledge is Open to Revision in Light of New Evidence   * Scientific explanations are subject to revision and improvement in light of new evidence. * The certainty and durability of scientific findings vary. * Scientific findings are frequently revised and/or reinterpreted based on new evidence. |
| SG4 | Students develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base. | NOS | Science Is a Human Endeavor   * Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination, and creativity. |

### Grade 6

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 6SG2.1 | *The student demonstrates an understanding of the bases of the advancement of scientific knowledge by* recognizing differences in results of repeated experiments. | NOS | Science Investigations Use a Variety of Methods   * Science investigations are guided by a set of values to ensure accuracy of measurements, observations, and objectivity of all findings. |

### Grade 7

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 7SG2.1 | *The student demonstrates an understanding of the bases of the advancement of scientific knowledge* by explaining differences in results of repeated experiment. | NOS | Scientific Knowledge Assumes an Order and Consistency in Natural Systems   * Science carefully considers and evaluates anomalies in data and evidence |
| 7SG3.1 | *The student demonstrates an understanding that scientific knowledge is ongoing and subject to change* by revising a personal idea when presented with experimental/observational data inconsistent with that personal idea (e .g., the rates of falling bodies of different masses) (L). | NOS | Scientific Knowledge is Open to Revision in Light of New Evidence   * The certainty and durability of science findings varies |

### Grade 8

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 8SG2.1 | *The student demonstrates an understanding of the bases of the advancement of scientific knowledge* by describing how repeating experiments improves the likelihood of accurate results. | NOS | Science Investigations Use a Variety of Methods   * Science investigations are guided by a set of values to ensure accuracy of measurements, observations, and objectivity of findings. |
| 8SG3.1 | *The student demonstrates an understanding that scientific knowledge is ongoing and subject to change* by revising a personal idea when presented with experimental/observational data inconsistent with that personal idea (e .g., the rates of falling bodies of different masses) (L). | NOS | Scientific Knowledge is Open to Revision in Light of New Evidence   * The certainty and durability of science findings varies |

# Science Grades 9-12

## A-1 Science as Inquiry and Process

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SA | Students develop an understanding of the processes and applications of scientific inquiry. | SEP  NOS | SEP #1, 2, 3, 4, 5, 6, 7, 8  Scientific Investigations Use a Varity of Methods   * Scientific inquiry is characterized by a common set of values that include logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. * Scientific investigations use a variety of methods, tools, and techniques to revise and produce new knowledge. |
| SA1 | Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments. | SEP | SEP #1, 3, 7 |
| SA2 | Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review. | NOS | Scientific Knowledge Is Based on Empirical Knowledge   * Scientific knowledge is based on empirical evidence. * Scientific arguments are strengthened by multiple lines of evidence supporting a single explanation.   Science is a Human Endeavor   * Scientific knowledge is a result of human endeavor, imagination, and creativity. |
| SA3 | Students develop an understanding that culture, local knowledge, history, and interaction with the environment, contribute to the development of scientific knowledge, and that local applications provide opportunity for understanding scientific concepts and global issues. | NOS | Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena   * Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.   Science is a Human Endeavor   * Individuals and teams from many nations and cultures have contributed to science and to advances in engineering. |

### Grade 9

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 9SA1.1 | *The student demonstrates an understanding of the processes of science* by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.\* | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 9SA1.2 | *The student demonstrates an understanding of the processes of science* by hypothesizing, designing a controlled experiment, making qualitative and quantitative observations, interpreting data, and using this information to communicate conclusions. | SEP | SEP #3, 4, 8 |
| 9SA2.1 | *The student demonstrates an understanding of the attitudes and approaches to scientific inquiry* by formulating conclusions that are logical and supported by evidence. | SEP | SEP #6, 7 |

### Grade 10

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 10SA1.1 | *The student demonstrates an understanding of the processes of science* by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring, and communicating. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 10SA1.2 | *The student demonstrates an understanding of the processes of science* by reviewing pertinent literature , hypothesizing, making qualitative and quantitative observations, controlling experimental variables, analyzing data statistically (i.e., mean, median, mode), and using this information to draw conclusions, compare results to others, suggest further experimentation, and apply student’s conclusions to other problems. | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 10SA2.1 | *The student demonstrates an understanding of the attitudes and approaches to scientific inquiry* by examining methodology and conclusions to identify bias and determining if evidence logically supports the conclusions. | NOS | Science is a Human Endeavor   * Scientists’ backgrounds, theoretical commitments, and fields of endeavor influence the nature of their findings. * Science and engineering are influenced by society, and society is influenced by science and engineering.   Scientific Investigations Use a Variety of Methods   * Scientific inquiry is characterized by a common set of values that include logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. |

### Grade 11

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 11SA1.1 | *The student demonstrates an understanding of the processes of science* by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring, and communicating.\* | SEP | SEP #1, 2, 3, 4, 5, 6, 7, 8 |
| 11SA1.2 | *The student demonstrates an understanding of the processes of science by* recognizing and analyzing multiple explanations and models, using this information to revise student’s own explanation or model if necessary. | NOS | Scientific Investigations Use a Variety of Methods   * Science depends on evaluating proposed explanations   Scientific Knowledge is Open to Revision in Light of New Evidence   * Most scientific knowledge is quite durable but, in principle, is subject to change based on new evidence and/or reinterpretation of existing evidence. |
| 11SA2.1 | *The student demonstrates an understanding of the attitudes and approaches to scientific inquiry* by evaluating the credibility of cited sources when conducting the student’s own scientific investigation. | SEP | SEP #8 |
| 11SA3.1 | *The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts* by conducting research and communicating results to solve a problem (e .g., fish and game management, building permits, mineral rights, land use policies). | SEP | SEP #6, 8 |

## B-1 Concepts of Physical Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SB | Students develop an understanding of the concepts, models, theories, universal principles, and facts that explain the physical world. | NOS | Science Models Laws, Mechanisms, and Theories Explain Natural Phenomena   * Theories and laws provide explanations in science, but theories do not with time become laws. * Models, mechanisms, and explanations collectively serve as tools in the development of a scientific theory. * Scientists often use hypotheses to develop and test theories and explanations. |
| SB1 | Students develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior. | DCI | HS-PS1.A: Structure of Matter |
| SB2 | Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved. | DCI  PE | HS-PS3.A: Definitions of Energy  HS-PS3.B: Conservation of Energy and Energy Transfer  HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. |
| SB3 | Students develop an understanding of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems. | DCI | HS-PS1.C: Nuclear Processes  HS-PS2.B: Types of Interactions |
| SB4 | Students develop an understanding of motions, forces, their characteristics and relationships, and natural forces and their effects. | DCI | HS-PS2.A: Forces and Motion  HS-PS2.B: Types of Interactions |

### Grade 9

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 9SB1.1 | *The student demonstrates an understanding of the structure and properties of matter* by describing atoms and their base components (i.e., protons, neutrons, electrons). | SEP  DCI | SEP #6  HS-PS1.A: Structure and Properties of Matter |
| 9SB2.1 | *The student demonstrates an understanding of how energy can be transformed, transferred, and conserved* by applying the concepts of heat transfer (i.e. , conduction, convection, radiation) to Alaskan dwellings. | SEP  DCI | SEP #6  MS-PS3.B: Conservation of Energy and Energy Transfer  HS-PS3.D: Energy in Chemical Processes and Everyday Life |
| 9SB2.2 | *The student demonstrates an understanding of how energy can be transformed, transferred, and conserved* by recognizing simple electric circuits. | DCI | HS-PS2.B Types of Interactions |
| 9SB3.1 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by recognizing that a chemical reaction has taken place. | DCI | 5-PS1.B: Chemical Reactions  MS-PS1.B: Chemical Reactions |
| 9SB3.2 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by explaining that in chemical and nuclear reactions, energy (e .g., heat, light, mechanical, and electrical) is transferred into and out of a system. | SEP  DCI | SEP #6  HS-PS1.B: Chemical Reactions  HS-PS1.C: Nuclear Processes |
| 9SB3.3 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by recognizing that atoms emit and absorb electromagnetic radiation. | DCI | HS-PS1.A: Structure and Properties of Matter  HS-PS3.A: Definitions of Energy  HS-PS3.B: Conservation of Energy and Energy Transfer  HS-PS4.B: Electromagnetic Radiation |
| 9SB4.1 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by explaining the relationship of motion to an object’s mass and the applied force. | SEP  DCI  PE | SEP #6  MS-PS2.A: Forces and Motion  HS-PS2.A: Forces and Motion  HS-PS2-1: Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.  HS-PS2-2: Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.  HS-PS2-3: Apply science and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. |
| 9SB4.2 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by recognizing that the gravitational attraction between objects is proportional to their masses and decreasing with their distance. | DCI  PE | MS-PS2.B: Types of Interactions  HS-PS2-4: Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects. |
| 9SB4.3 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by describing the interactions of waves (i.e., reflection, refraction, wave addition). | SEP  DCI  PE | SEP #6  HS-PS4.A: Wave Properties  HS-PS4-1: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling through various media. |

### Grade 10

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 10SB1.1 | *The student demonstrates an understanding of the structure and properties of matter* by using the periodic table to describe atoms in terms of their base components (i.e., protons, neutrons, electrons). | SEP  DCI  PE | SEP #6  HS-PS1.A: Structure of Matter  HS-PS1-1: Use the periodic table as a model to predict the relative properties of elements based on their patterns of electrons in the outermost energy level of atoms (valence electrons). |
| 10SB2.1 | *The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by examining energy (i.e., nuclear, electromagnetic, chemical, mechanical, thermal) transfers, transformations, and efficiencies* by comparing useful energy to total energy. | SEP  DCI  PE | SEP #1, 4, 6  HS-PS3.D: Energy in Chemical Processes and Everyday Life  HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. |
| 10SB3.1 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by describing the behavior of electrons in chemical bonding. | SEP  DCI  PE | SEP #6  HS-PS1.B: Chemical Reactions  HS-PS1-4: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends on the changes in total bond energy.  HS-PS1-2: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. |
| 10SB3.2 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by recognizing that radioactivity is a result of the decay of unstable nuclei. | DCI | HS-PS1.C: Nuclear Processes |
| 10SB3.3 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by comparing the relative wavelengths and applications of different forms of electromagnetic radiation (i.e., x-ray, visible, infrared, microwaves, radio). | SEP  DCI  PE | SEP #4  HS-PS4.B: Electromagnetic Radiation  HS-PS4-3: Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.  HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. |
| 10SB4.1 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by recognizing that when one thing exerts a force on another, an equal amount of force is exerted back on it. | DCI  PE | 3-PS2.B: Types of Interactions  3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. |
| 10SB4.2 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by explaining that different kinds of materials respond to electric and magnetic forces (i.e., conductors, insulators, magnetic, and non-magnetic materials. | CCC  DCI  PE | Cross Cutting Concept 5-PS3-1:   * Energy can be transferred in various ways and between objects.   HS-PS2.B: Types of Interactions  HS-PS2-4: Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects.  HS-PS2-5: Plan and conduct an investigation to provide evidence that an electrical current can produce a magnetic field and that a changing magnetic field can produce an electric current. |

### Grade 11

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| 11SB1.1 | *The student demonstrates an understanding of the structure and properties of matter* by predicting the properties of an element (i.e., reactivity, metal, non-metal) using the periodic table and verifying the predictions through experimentation. | SEP  DCI  PE | SEP #4  HS-PS1.A: Structure of Matter  HS-PS1-2: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. |
| 11SB2.1 | *The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by demonstrating energy (e .g., nuclear, electromagnetic, chemical, mechanical, thermal) transfers and transformations* by comparing useful energy to total energy (entropy). | SEP  DCI  PE | SEP #1, 4, 6  HS-PS3.D: Energy in Chemical Processes and Everyday Life  HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. |
| 11SB3.1 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by predicting how an atom can interact with other atoms based on its electron configuration and verifying the results. | SEP  DCI  PE | SEP #3, 4  HS-PS1.A: Structure of Matter  HS-PS1-4: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. |
| 11SB3.2 | *The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems* by researching applications of nuclear reactions in which a small amount of matter is converted directly into a huge amount of energy (i.e., E=MC2). | SEP  DCI | SEP #8  HS-PS1.C: Nuclear Processes  HS-PS3.A: Definitions of Energy |
| 11SB4.1 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by conducting an experiment to demonstrate that when one thing exerts a force on another, an equal amount of force is exerted back on it. | DCI  PE | 3-PS2.B: Types of Interactions  3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. |
| 11SB4.2 | *The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects* by conducting an experiment to explore the relationship between magnetic forces and electric forces to show that they can be thought of as different aspects of a single electromagnetic force (e .g., generators and motors). | SEP  DCI  PE | SEP #3  HS-PS4.B: Electromagnetic Radiation  HS-PS2-5: Plan and conduct an investigation to provide evidence that an electrical current can produce a magnetic field and that a changing magnetic field can produce and electrical current. |

## C-1 Concepts of Life Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC | Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science. | NOS | Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena   * Theories and laws provide explanations in science, but theories do not with time become laws or facts. * A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that has been repeatedly confirmed through observation and experiment. The science community validates each theory before it is accepted. If new evidence is discovered that a theory does not accommodate, the theory is generally modified in light of new evidence. |
| SC1 | Students develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution. | DCI | LS1.A: Structure and Function  LS3.A: Inheritance of Traits  LS4.A: Evidence of Common Ancestry and Diversity  LS4.B: Natural Selection |
| SC2 | Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms. | DCI | LS1.A: Structure and Function  LS1.B: Growth and Development of Organisms  LS3.B: Variation of Traits |
| SC3 | Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy. | DCI | LS1.C: Organization for Matter and Energy Flow in Organisms  LS2.B: Cycles of Matter and Energy in Ecosystems |

### Grade 9

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC1.1 | *The student demonstrates understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution* by recognizing that all organisms have chromosomes made of DNA and that DNA determines traits. | DCI  PE | HS-LS1.A: Structure and Function  HS-LS3.A: Inheritance of Traits  HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. |
| SC1.2 | *The student demonstrates understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution* by using probabilities to recognize patterns of inheritance (e.g., Punnett Squares) samples, recorded history. | SEP  DCI  PE | SEP #4  MS-LS3.B: Variation of Traits  HS-LS4.A: Evidence of Common Ancestry  HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. |
| SC1.3 | *The student demonstrates understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution* by inferring evolutionary pathways from evidence (e .g., fossils, geologic samples, recorded history). | SEP  DCI  PE | SEP #4, 7  HS-LS4.A: Evidence of Common Ancestry  HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. |
| SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing and comparing the characteristics of phyla/divisions from each kingdom. | SEP | SEP #4 |
| SC2.3 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by stating the function of major physiological systems (i.e., circulatory, excretory, digestive, respiratory, reproductive, nervous, immune, endocrine, musculoskeletal, and integumentary). | DCI  PE | HS-LS1.A: Structure and Function  HS-LS1-2: Develop and use a model to illustrate the hierarchal organization of interacting systems that provide specific functions within multicellular organisms. |
| SC3.1 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by* describing the carbon and nitrogen cycle within an ecosystem and how the continual input of energy from sunlight keeps the process going. (L) | DCI  PE | HS-LS2.B: Cycles of Matter and Energy Transfer in Ecosystems  HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere and geosphere. |
| SC3.3 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by identifying dynamic factors (e .g., carrying capacity, limiting factors, biodiversity, and productivity) that affect population size. | DCI  PE | HS-LS2.A: Interdependent Relationships in Ecosystems  HS-LS2.C: Ecosystem Dynamics, Functioning, and Resilience  HS-LS2-6: Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. |

### Grade 10

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC1.2 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution* by explaining how the processes of natural selection can cause speciation and extinction. | SEP  DCI  PE | SEP #6  HS-LS4.B: Natural Selection  HS-LS4.C: Adaptation  HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations. |
| SC1.3 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution* by examining issues related to genetics. (L) | SEP  DCI | SEP #8  HS-LS1.A: Structure and Function  HS-LS3.A: Inheritance of Traits  HS-LS3.B: Variation of Traits |
| SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing the structure-function relationship (e .g., joints, lungs). | SEP  DCI  PE | SEP #6  HS-LS1.A: Structure and Function  HS-LS1-2: Develop and use a model to illustrate the hierarchal organization of interacting systems that provide specific functions within multicellular organisms. |
| SC2.2 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by explaining that cells have specialized structures in which chemical reactions occur. | SEP  DCI  PE | SEP #6  MS-LS1.A: Structure and Function  HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy. |
| SC2.3 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by explaining the functions of organs of major systems (i.e., respiratory, digestive, circulatory, reproductive, nervous, musculoskeletal, and excretory). | DCI  PE | HS-LS1.A: Structure and Function  HS-LS1-2: Develop and use a model to illustrate the hierarchal organization of interacting systems that provide specific functions within multicellular organisms. |
| SC2.4 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by tracing the pathways of the digestive, circulatory, and excretory systems. |  | *Not expressly included in the SSA.* |
| SC3.1 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by relating the carbon cycle to global climate change. | SEP  DCI  PE | SEP #6  MS-ESS3.D: Global Climate Change  HS-ESS2.D: Weather and Climate  HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.  HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and future impacts to Earth’s systems. |
| SC3.2 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by exploring ecological relationships (e .g., competition, niche, feeding relationships, symbiosis). (L) | DCI  PE | MS-LS2.A: Interdependent Relationships in Ecosystems  HS-LS2.A: Interdependent Relationships in Ecosystems  HS-LS2.C: Ecosystem Dynamics, Functioning, Resilience  HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of difference scales. |

### Grade 11

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SC1.1 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution* by relating the structure of DNA to characteristics of an organism. | DCI  PE | HS-LS1.A: Structure and Function  HS-LS3.A: Inheritance of Traits  HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. |
| SC1.2 | *The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution* by researching how the processes of natural selection cause changes in species over time. (L) | SEP  DCI  PE | SEP #8  HS-LS4.B: Natural Selection  HS-LS4.C: Adaptation  HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.  HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.  HS-LS4-4: Construct an explanation for how natural selection leads to adaptation of populations. |
| SC2.1 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing the structure-function relationship. \* | SEP  DCI  PE | SEP #6  HS-LS1.A: Structure and Function  HS-LS1-2: Develop and use a model to illustrate the hierarchal organization of interacting systems that provide specific functions within multicellular organisms. |
| SC2.2 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing the learned behaviors (e .g., classical conditioning, imprinting, trial and error) that are utilized by living organisms to meet the requirements of life. | DCI  PE | 3-5-LS3.A: Inheritance of Traits  3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.  MS-LS1-4: Use an evidence-based argument to support an explanation for characteristic behaviors and/or structures of organisms affect the probability of their successful reproduction.  MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. |
| SC2.3 | *The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms* by describing the functions and interdependencies of the organs within the immune system and within the endocrine system. | DCI  PE | HS-LS1.A: Structure and Function  HS-LS1-2: Develop and use a model to illustrate the hierarchal organization of interacting systems that provide specific functions within multicellular organisms. |
| SC3.1 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by relating the carbon cycle to global climate change. \* | SEP  DCI  PE | SEP #6  MS-ESS3.D: Global Climate Change  HS-ESS2.D: Weather and Climate  HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.  HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and future impacts to Earth’s systems. |
| SC3.2 | *The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy* by analyzing the potential impacts of changes (e .g., climate change, habitat loss/gain, cataclysms, human activities) within an ecosystem. | SEP  DCI  PE | SEP #4  HS-ESS3.B: Natural Hazards  HS-ESS3.C: Human Impacts on Earth Systems  MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.  HS-LS2-6: Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.  HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.  HS-ESS3-3: Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. |

## D-1 Concepts of Earth Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD | Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences. | NOS | Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena   * Theories and laws provide explanations in science, but theories do not with time become laws or facts. * A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that has been repeatedly confirmed through observation and experiment. The science community validates each theory before it is accepted. If new evidence is discovered that a theory does not accommodate, the theory is generally modified in light of new evidence. |
| SD1 | Students develop an understanding of Earth’s geochemical cycles. | DCI | MS-ESS2.A: Earth Materials and Systems  HS-ESS2.A: Earth Materials and Systems  HS-ESS2.B: Plate Tectonics and Large-Scale System Interactions |
| SD2 | Students develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth. | DCI | MS-ESS1.C: The History of Planet Earth  HS-ESS1.C: The History of Planet Earth |
| SD3 | Students develop an understanding of the cyclical changes controlled by energy from the sun and by Earth’s position and motion in our solar system. | DCI | MS-ESS1.B: Earth and the Solar System  HS-ESS1.B: Earth and the Solar System |
| SD4 | Students develop an understanding of the theories regarding the evolution of the universe. | DCI | HS-ESS1.A The Universe and Its Stars |

### Grade 9

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD1.1 | *The student demonstrates an understanding of geochemical cycles* by using a model to demonstrate the rock cycle. (L) | DCI  PE | MS-ESS2.A: Earth’s Materials and Systems  MS-ESS2-1: Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process. |
| SD1.2 | *The student demonstrates an understanding of geochemical cycles* by applying knowledge of the water cycle to explain changes in the Earth’s surface.\* | DCI  PE | MS-ESS2.C: The Roles of Water in Earth’s Surface Process  MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. |
| SD2.1 | *The student demonstrates an understanding of the forces that shape Earth* by recognizing the dynamic interaction of erosion and deposition including human causes. | DCI  PE | HS-ESS2.C: The Roles of Water in Earth’s Surface Process  HS-ESS3.C: Human Impacts on Earth’s Systems  HS-ESS2-1: Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.  HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. |
| SD2.2 | *The student demonstrates an understanding of the forces that shape Earth* by describing how the theory of plate tectonics explains the dynamic nature of its surface. | DCI  PE | MS-ESS2.B: Plate Tectonics and Large-scale System Interactions  HS-ESS2.B: Plate Tectonics and Large-scale System Interactions  HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.  HS-ESS2-1: Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. |
| SD3.1 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by recognizing the effect of the moon and sun on tides. | DCI  PE | MS-ESS1.A: The Universe and Its Stars  MS-ESS2.C: The Roles of Water in Earth’s Surface Process  MS-ESS1-1a: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon.  MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. |
| SD3.2 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by explaining the phenomena of the aurora. |  | *Not expressly included in the SSA.* |
| SD4.1 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by recognizing that a star changes over time. | DCI  PE | HS-ESS1-A: The Universe and its Stars  HS-ESS1-1: Develop a model based on evidence to illustrate that the life span of the Sun is a function of nuclear fusion in its core, and that stars, through nuclear fusion over their life cycle, produce elements and release energy that eventually reaches Earth in the form of radiation.  HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. |
| SD4.2 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by explaining that the position of stars changes in the expanding universe. | DCI  PE | HS-ESS1.A: The Universe and its Stars  HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.  HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. |
| SD4.4 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by identifying the Big Bang Theory. | PE | HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. |

### Grade 10

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD1.1 | *The student demonstrates an understanding of geochemical cycles* by using a model to explain the processes (i.e., formation, sedimentation, erosion, reformation) of the rock cycle. | DCI  PE | HS-ESS2.A: Earth Materials and Systems  HS-ESS2-1: Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. |
| SD1.2 | *The student demonstrates an understanding of geochemical cycles* by describing their interrelationships (i.e., water cycle, carbon cycle, oxygen cycle). | DCI  PE | HS-ESS2.A: Biogeology  HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.  HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. |
| SD2.1 | *The student demonstrates an understanding of the forces that shape Earth* by recognizing the dynamic interaction of erosion and deposition including human causes. \* | DCI  PE | HS-ESS2.C: The Roles of Water in Earth’s Surface Processes  HS-ESS2-5: Plan and conduct an investigation of water and its effects on Earth materials and surface processes. |
| SD2.2 | *The student demonstrates an understanding of the forces that shape Earth* by describing how the theory of plate tectonics explains the dynamic nature of its surface. \* | DCI | HS-ESS2.B: Plate Tectonics and Large-Scale System Interactions |
| SD3.1 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by describing causes, effects, preventions, and mitigations of human impact on climate. | DCI  PE | HS-SS3.D: Global Climate Change  HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.  HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth’s systems. |
| SD4.1 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by recognizing phenomena in the universe (i.e., black holes, nebula). | DCI | HS-ESS1.A: The Universe and its Stars  HS-ESS1.B: Earth and the Solar System |
| SD4.2 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by explaining that the position of stars changes in the expanding universe. \* | DCI  PE | HS-ESS1-A: The Universe and its Stars  HS-ESS1-1: Develop a model based on evidence to illustrate that the life span of the Sun is a function of nuclear fusion in its core, and that stars, through nuclear fusion over their life cycle, produce elements and release energy that eventually reaches Earth in the form of radiation. |
| SD4.4 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by describing the Big Bang Theory. | DCI  PE | HS-ESS1.A: The Universe and its Stars  HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.  HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. |

### Grade 11

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SD1.1 | *The student demonstrates an understanding of geochemical cycles* by creating a model to demonstrate the rock cycle. (L) | PE | HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. |
| SD1.2 | *The student demonstrates an understanding of geochemical cycles* by integrating knowledge of the water cycle and biogeochemical cycling to explain changes in the Earth’s surface. (L) | DCI  PE | HS-ESS2.A: Biogeology  HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.  HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. |
| SD2.1 | *The student demonstrates an understanding of the forces that shape Earth* by recognizing the dynamic interaction of erosion and deposition including human causes. \* | DCI  PE | HS-ESS2.C: The Roles of Water in Earth’s Surface Processes  HS-ESS2-5: Plan and Conduct an investigation of the properties of water and its effects on Earth materials and surface processes. |
| SD2.2 | *The student demonstrates an understanding of the forces that shape Earth* by describing how the theory of plate tectonics explains the dynamic nature of its surface. \* | DCI  PE | HS-ESS2.B: Plate Tectonics and Large-Scale System Interactions  HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rock. |
| SD3.1 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by describing causes, effects, preventions, and mitigations of human impact on climate. \* | DCI  PE | HS-ESS3.D: Global Climate Change  HS-ESS3-6: Use a computational representation to illustrate relationships among Earth systems and how those relationships are being modified due to human activity. |
| SD3.2 | *The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system* by exploring causes and effects related to phenomena (e .g. the aurora , solar winds, Coriolis Effect). (L ) | SEP  DCI | SEP #1, 6, 7  HS-ESS1.A: The Universe and its Stars |
| SD4.1 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by describing phenomena in the universe (i.e., black holes, nebula). | DCI | HS-ESS1.A: The Universe and its Stars  HS-ESS1.B: The Earth and the Solar System |
| SD4.2 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by using evidence to explain how the position of stars changes in the expanding universe. | DCI  PE | HS-ESS1.A: The Universe and its Stars  MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. |
| SD4.4 | *The student demonstrates an understanding of the theories regarding the origin and evolution of the universe* by describing the Big Bang Theory and exploring the evidence that supports it. (L) | PE | HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. |

## E-1 Science and Technology

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SE | Students develop an understanding of the relationships among science, technology, and society. | ETAS | Interdependence of Science, Engineering, and Technology   * Science and Technology drive each other forward.   Influence of Engineering, Technology, and Science and the Natural World   * The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. |
| SE1 | Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events. | NOS | Science Addresses Questions About the Natural and Material World |
| SE2 | Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits. | NOS | Science is a Human Endeavor |
| SE3 | Students develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures. | NOS | Science is a Human Endeavor:   * Science and engineering are influenced by society and society is influenced by science and engineering. |

### Grade 9

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SE1.1 | *The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems* by recognizing that the value of any given technology may be different for different groups of people and at different points in time (e .g., different uses of snow machines in different regions of Alaska). | ETAS  PE | Influence of Engineering, Technology, and Science and the Natural World   * The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time.   HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts |
| SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking* by questioning, researching, modeling, simulating, and testing a solution to a problem. (L) | SEP  PE | SEP #1, 2, 4  HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |
| SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society* by predicting and evaluating the possible effects of a recent scientific discovery, invention, or scientific breakthrough. (L) | PE | MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precisions to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |

### Grade 10

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SE1.1 | *The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems* by identifying that progress in science and invention is highly interrelated to what else is happening in society. | ETAS  PE | Influence of Engineering, Technology, and Science on Society and the Natural World   * New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.   HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. |
| SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking* by questioning, researching, modeling, simulating, and testing multiple solutions to a problem. (L) | NOS | Understandings About the Nature of Science:   * Science is both a body of knowledge and the processes and practices used to add to that body of knowledge. |
| SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society* by researching a current problem, identifying possible solutions, and evaluating the impact of each solution. (L) | ETAS  PE | Influence of Engineering, Technology, and Science on Society and the Natural World   * Analysis of costs and benefits is a critical aspect of decisions about technology.   MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. |

### Grade 11

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SE1.1 | *The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems* by researching how social, economic, and political forces strongly influence which technology will be developed and used. (L ) | NOS | Science is a Human Endeavor |
| SE2.1 | *The student demonstrates an understanding that solving problems involves different ways of thinking* by questioning, researching, modeling, simulating, and testing multiple solutions to a problem. \* (L) | SEP  ETAS | SEP #1, 2, 6  Interdependence of Science, Engineering, and Technology   * Science and engineering complement each other in the cycle known as research and development (R&D). |
| SE3.1 | *The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society* by researching a current problem, identifying possible solutions, and evaluating the impact of each solution. \* (L) | PE | HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. |

## F-1 Cultural, Social, Personal Perspectives, and Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SF | Students develop an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives. | NOS  ASCRS | Science is a Way of Knowing  B. Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life. |
| SF1 | Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology. | NOS  ASCRS | Science is a Human Endeavor  A. Culturally knowledgeable students are well-grounded in the cultural heritage and traditions of their community. |
| SF2 | Students develop an understanding that some individuals, culture s, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world. | ASCRS | E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. |
| SF3 | Students develop an understanding of the importance of recording and validating cultural knowledge. | ASCRS | D. Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. |

### Grade 9

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SF1.1-1.3 | *The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives* by describing the scientific principles involved in a subsistence activity (e.g., hunting, fishing, gardening). (L) | NOS  ASCRS | Science is a Human Endeavor   * Science affects everyday life.   B.2: Culturally-knowledgeable students…(can) make effective use of the knowledge, skills, and ways of knowing from their own cultural traditions to learn about the larger world in which they live. |

### Grade 10

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SF1.1-1.3 | *The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by analyzing the competition for resources* by various user groups to describe these interrelationships. | SEP  PE | SEP #4  HS-ESS3-3: Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of the human population, and biodiversity. |

### Grade 11

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SF1.1-1.3 | *The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives* by investigating the influences of societal and/or cultural beliefs on science. (L) | NOS  SEP | Science is a Human Endeavor   * Science and engineering are influenced by society and society is influenced by science and engineering.   SEP #8 |

## G-1 History and Nature of Science

### General Standards

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SG | Students develop an understanding of the history and nature of science. | NOS | Understandings About the Nature of Science |
| SG1 | Students develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge. | NOS | Scientific Knowledge is Open to Revision in Light of New Evidence  Science is a Way of Knowing |
| SG2 | Students develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world. | NOS | Science is a Way of Knowing  Science is a Human Endeavor |
| SG3 | Students develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s). | NOS | Scientific Knowledge is Open to Revision in Light of New Evidence |
| SG4 | Students develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base. | NOS | Science is a Human Endeavor |

### Grade 9

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SG1.1 | *The student demonstrates an understanding of changes in historical perspectives of science* by identifying those perspectives (i.e., cultural, political, religious, philosophical) that have impacted the advancement of science. | NOS | Science is Way of Knowing   * Science is a unique way of knowing and there are other ways of knowing. |
| SG2.1 | *The student demonstrates an understanding of the bases of the advancement of scientific knowledge* by explaining the importance of innovations (i..e., microscope, immunization, computer). | NOS | Science is a Human Endeavor   * Advances in technology influence the progress of science and science has influenced advances in technology. |
| SG3.1 | *The student demonstrates an understanding that scientific knowledge is ongoing and subject to change* by describing the role of serendipity in scientific discoveries. |  | *Not expressly included in the SSA.* |

### Grade 10

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SG1.1 | *The student demonstrates an understanding of changes in historical perspectives of science* by describing how those perspectives (i.e., cultural, political, religious, philosophical) have impacted the advancement of science. | SEP  NOS | SEP #8  Scientific Knowledge is Open to Revision in Light of New Evidence  Science is Human Endeavor  Science is a Way of Knowing |
| SG2.1 | *The student demonstrates an understanding of the basis of the advancement of scientific knowledge* by using an account of an event to recognize the processes of science used by historically significant scientists (e .g., Goodall, Watson & Crick, Newton). |  | *Not expressly included in the SSA.* |
| SG3.1 | *The student demonstrates an understanding that scientific knowledge is ongoing and subject to change* by using experimental or observational data to evaluate a hypothesis. | SEP  NOS | SEP #4  Scientific Knowledge is Open to Revision in Light of New Evidence |
| SG4.1 | *The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base* by recognizing the role of these factors on scientific advancement. | NOS | Science is Human Endeavor |

### Grade 11

| **GLE Identifier** | **GLE** | **SSA Identifier(s)** | **SSA**  **Where and how this concept or skill is addressed** |
| --- | --- | --- | --- |
| SG2.1 | *The student demonstrates an understanding of the bases of the advancement of scientific knowledge* by describing the importance of logical arguments (i.e., thought experiments by Einstein, Hawking, Newton). |  | *Not expressly included in the SSA.* |
| SG3.1 | *The student demonstrates an understanding that scientific knowledge is ongoing an d subject to change* by investigating instances when scientists’ observations were not in accord with prevailing ideas of the time. (L) | NOS | Science is a Human Endeavor   * Science and engineering are influenced by society and society is influenced by science and engineering. |