AERO NGSS ALIGNMENT BY PEROFRMANCE EXPECTATIONS (NGSS) PERFORMANCE INDICATORS (AERO) K to 4

Earth Science

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
ESS1.A The universe and its stars	Patterns of movement of the sun, moon, and stars as seen from Earth can be observed, described, and predicted. *1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted* *1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year*	Stars range greatly in size and distance from Earth and this can explain their relative brightness. *5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.*	Stars and Galaxies	ESS.1.4A By the end of Grade 4, students will observe and identify objects and their apparent motion in the day and night sky.	• Explain that there are more stars in the sky than anyone can easily count. • Explain that stars are not scattered evenly and they are not always the same brightness and color. • Explain that the patterns in the sky remain stable but appear to move across the sky because of the Earth's motion. • Explain that stars are like the sun, some being smaller and some larger, but so far away that they look like points of light. • Investigate and describe how distance affects the brightness of any light source

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ESS1.B Earth and the solar system	Patterns of movement of the sun, moon, and stars as seen from Earth can be observed, described, and predicted. *1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted* *1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year* *Continued from page 2*	The Earth's orbit and rotation, and the orbit of the moon around the Earth cause observable patterns. *-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky* *Continued from page 2*	The Solar System	ESS.1.4 B: By the end of Grade 4, students will relate the motions of the Earth-sun-moon system to units of time (days, months, years).	• Identify objects in the day and night sky (e.g., moon, stars, or sun). • Observe that the sun can be seen only in the daytime, but the moon can be seen sometimes at night and sometimes during the day. • Observe and describe the sun, moon, ~~planets~~, and stars. • Identify the sun, moon, and the Earth as components of our solar system. • Observe and describe properties, locations, and movements of the sun, moon, stars, ~~and clouds~~. •
			The Moon	ESS.1.4C: By the end of Grade 4, students will describe the moon's orbit around the Earth as once in about 28 days and our changing views of the moon allow us to see a changing portion of the lighted side of the moon, which we call "phases".	• Identify that the moon and stars are usually seen at night • Observe and discuss the importance of objects in the day and night sky • Observe and describe the changes of the moon's appearance over a month. • Describe the relative movement of the Earth and moon in relation to the sun • Demonstrate the phases of the moon by showing the alignment of the earth, moon,

					and sun.

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ESS1.B Earth and the solar system	Patterns of movement of the sun, moon, and stars as seen from Earth can be observed, described, and predicted. *1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted* *1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year* *Continued from page 3*	The Earth's orbit and rotation, and the orbit of the moon around the Earth cause observable patterns. *-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky* *Continued from page 3*	The Earth	**ESS.1.4 B:** By the end of Grade 4, students will relate the motions of the Earth-sun-moon system to units of time (days, months, years).	• Describe Earth's position and movement in the solar system. • Use models to demonstrate how the rotation of the Earth on its axis every 24 hours produces the night-and-day cycle. • Use models to demonstrate how the revolution of the Earth around the sun produces the yearly cycle. • Observe and record shadows at different times of the day. (addressed in **PS.3.4D**

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ESS1.C The history of planet Earth	Some events on Earth occur very quickly; others can occur very slowly. *2-ESS1-1. Make observations from media to construct an evidence-based account that Earth events can occur quickly or slowly*	Certain features on Earth can be used to order events that have occurred in a landscape *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*	Erosion and Weathering	**ESS.2.4A:** By the end of Grade 4, students will explain how wind, water, or ice shape and reshape the earth.	• Identify the processes of physical weathering that break down rocks at Earth's surface (i.e., water movement, freezing, plant growth, wind). • Distinguish between weathering (i.e., wearing down and breaking of rock surfaces) and erosion (i.e., the movement of materials). • Model erosion of Earth materials and collection of these materials as part of the process that leads to soil (e.g., water moving sand in a playground area and depositing this sand in another area). • Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments. • Observe seasonal and weather changes throughout the school year.

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ESS1.C The history of planet Earth	Some events on Earth occur very quickly; others can occur very slowly. *2-ESS1-1. Make observations from media to construct an evidence-based account that Earth events can occur quickly or slowly* *Continued from page 5*	Certain features on Earth can be used to order events that have occurred in a landscape. *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* *Continued from page 5*	Earth's Features Fossils	**ESS.2.4A:** By the end of Grade 4, students will explain how wind, water, or ice shape and reshape the earth. **ESS.3.4A** By the end of Grade 4, Students will use physical properties to sort, classify, and describe earth materials (soils, rocks or minerals).	• Identify sudden and gradual changes that affect the Earth (e.g. sudden change = flood; gradual change = erosion caused by oceans). • Describe changes in Earth's surface that are due to slow processes (including weathering, erosion, and deposition • Describe changes in Earth's surface that are due to rapid processes (including landslides, volcanic eruptions, floods, and earthquakes). • Identify types of fossils (including molds, casts, and preserved parts of plants and animals). • Identify features of fossils that can be used to compare them to living organisms that are familiar. • Explain how fossils can be used to make inferences about past life, climate, geology, and environments.

					• Cite two scientific explanations for the extinction of dinosaurs and their prehistoric organisms.

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ESS2.A Earth materials and systems	**Wind and water change the shape of the land.** 2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	**Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around.** *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.* *5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or*	Interaction of Water with Earth Materials	ESS.2.4B: By the end of Grade 4, students will use results from an experiment to draw conclusions about how water interacts with earth materials (e.g., percolation, erosion, frost heaves).	• Conduct tests on how different soils retain water (e.g., how fast does the water drain through?). • Conduct investigations and use observational data to describe how water moves rocks and soils. • Examine materials that compose soil (i.e., sand, clay, humus, gravel, water) and describe these on the basis of their properties (i.e., color, luster, granularity, texture, mass relative to size, particle size, ability to absorb water, pore space, ability to compact). • Explain how waves, wind, water, glacier movement, and ice, shape and reshape the Earth's land surface by eroding rock and sand in some areas, and depositing them in other areas.

		atmosphere interact.			

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ESS2.A Earth materials and systems	**Wind and water change the shape of the land.** 2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. *Continued from page 7*	**Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around.** *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.* *5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.* *Continued from page 7*	**Results of the Processes**	**ESS.2.4A:** By the end of Grade 4, students will explain how wind, water, or ice shape and reshape the earth.	• Investigate local landforms and how wind, water, or ice have shaped and reshaped them • Use or build models to simulate the effects of how wind and water shape and reshape the land. • Explain and give examples of the ways in which soil is formed (the weathering of rock by water and wind and from the decomposition of plant and animal remains). • Identify the processes of physical weathering that break down rocks at Earth's surface (i.e., water movement, freezing, plant growth, wind). • Distinguish between weathering (i.e., wearing down and breaking of rock surfaces) and erosion (i.e., the movement of materials). • Model erosion of Earth materials and collection of these materials as part of the process that leads to soil (e.g., water moving sand in a playground area and depositing this sand in

					another area • Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments.

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ESS2.B Plate tectonics and large-scale system interactions	Maps show where things are located. One can map the shapes and kinds of land and water in any area. *2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area*	Earth's physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events. *4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.*	Rocks and minerals	ESS.3.4A By the end of Grade 4, Students will use physical properties to sort, classify, and describe earth materials (soils, rocks or minerals).	• Illustrate the locations of water on Earth by using drawings, maps, or models. • Illustrate Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers).
			Results of the Processes Earth's Features	ESS.2.4A: By the end of Grade 4, students will explain how wind, water, or ice shape and reshape the earth.	• Describe land features (including volcanoes, mountains, valleys, canyons, caverns, and islands) by using pictures, diagrams, and maps.

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ESS2.C The roles of water in Earth's surface processes	Water is found in many types of places and in different forms on Earth. *2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.*	Most of Earth's water is in the ocean and much of the Earth's fresh water is in glaciers or underground *5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.*	Rocks and minerals	ESS.3.4A By the end of Grade 4, Students will use physical properties to sort, classify, and describe earth materials (soils, rocks or minerals).	• Describe the observable properties of water (including the fact that it takes the shape of its container, flows downhill, and feels wet). • Illustrate the locations of water on Earth by using drawings, maps, or models. • Illustrate Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers). • Summarize the processes of the water cycle (including evaporation, condensation, precipitation, and runoff). • Compare soil samples by sorting them according to properties (including color, texture, and the capacity to retain water). • Test soils (touch and roll, smear, settling, ability to absorb and retain water) and compare and contrast the properties.

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ESS2.C The roles of water in Earth's surface processes	Water is found in many types of places and in different forms on Earth. *2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.* *Continued from page 10*	Most of Earth's water is in the ocean and much of the Earth's fresh water is in glaciers or underground *5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.* *Continued from page 10*	What Drives the Water Cycle	ESS.5.4A: By the end of Grade 4, students will provide evidence showing that the sun is the source of heat and light for Earth and is essential for plant growth.	• Investigate and record temperature data to show the effects of heat energy on changing the states of water. • Identify the sun as the source of energy that evaporates water from the surface of Earth.

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ESS2.D Weather and Climate	Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time. *K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.*	Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed. *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.*	Weather	ESS.6.4A: By the end of Grade 4, students will collect daily weather observation and describe weather changes or weather pattern based on data collected.	• Observe and record daily changes in weather (e.g., clouds or air temperature). • Describe weather by measurable quantities such as temperature, wind direction, wind speed, precipitation and barometric pressure. • Graph recorded weather data to show daily and seasonal patterns in weather. • Identify and describe short- and longer-term patterns of events (including weather and seasons) that occur on the Earth and in the sky.
			Using Tools to Gather Data About Weather Predicting the Weather	ESS.6.4B: By the end of Grade 4, students will explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).	• Describe weather by measurable quantities such as temperature and precipitation. • Observe, measure, and record data on the basic elements of weather over a period of time (i.e., precipitation, air temperature, wind speed and direction, and air pressure) • Identify and use the tools of a meteorologist (e.g., measure rainfall using rain gauge, measure air pressure using barometer, measure temperature using a

					thermometer, measure wind speed using an aneometer).

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ESS2.D Weather and Climate	Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time. ***K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.*** *Continued from page 12*	Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed. ***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.*** *Continued from page 12*	**Using Tools to Gather Data About Weather** **Predicting the Weather**	**ESS.6.4B:** By the end of Grade 4, students will explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).	• Relate weather forecast accuracy to evidence or tools used to make the forecast (e.g. feels like rain vs. barometer reading is dropping). • Predict weather and justify prediction with observable evidence. • Predict temperature and precipitation changes associated with the passing of various fronts. • Record local weather information on a calendar or map and describe changes over a period of time (e.g., barometric pressure, temperature, precipitation symbols and cloud conditions). • Determine how weather observations and measurements are combined to produce weather maps and that data for a specific location at one point in time can be displayed in a station model. • Read a weather map to interpret local, regional and national weather.

					• Describe how temperature and precipitation determine climatic zones (biomes) (e.g., desert, grasslands, forests, tundra and alpine).

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ESS2.E Biogeology	Plants and animals can change their local environment. *K-ESS2-1. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.*	Living things can affect the physical characteristics of their environment. *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.*	Interactions among Organisms and their Environment	LS.3.4A: By the end of Grade 4, students will describe ways plants and animals depend on each other (e.g., shelter, nesting, food).	• Describe how people and other animals interact with the environment through their senses of sight, hearing, touch, smell, and taste. • Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash, hunting/conservation of species, paving/restoring greenspace). • Identify the ways a specific organism may interact with other organisms or with the environment (e.g., pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism).

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ESS3.A Natural resources	Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do *K-ESS2-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.*	Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not. *4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.*	Rocks and minerals	ESS.3.4A By the end of Grade 4, Students will use physical properties to sort, classify, and describe earth materials (soils, rocks or minerals).	• Identify the earth materials (i.e., rocks, soil, water, air) found in aquatic and terrestrial environments. • Use the senses to observe and describe the properties of a variety of earth materials (i.e., rock, soil, sand, water). • Describe, compare, and sort rocks, soils, and minerals by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, hardness, composition, reaction to vinegar). • Use the physical properties of hardness, color, luster, and reaction to vinegar (weak acid). to identify common minerals • Identify the importance of minerals, ores, and fossil fuels as Earth's resources on the basis of their properties. • Use the senses to observe and then describe the physical properties of soil components. • Conduct simple tests to identify the three basic components of soil (sand,

					clay, humus).
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ESS3.A Natural resources	Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do *K-ESS2-1Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.* *Continued from page 15*	Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not. *4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.* *Continued from page 15*	Uses of Earth's Materials	ESS.3.4B By the end of Grade 4, students will explain how their characteristics of various earth materials lend themselves to specific uses	• Identify the composition of Earth (including rocks, sand, soil, and water). • Identify which materials are best for different uses (e.g., soils for growing plants, sand for the sand box.) • Identify different uses (e.g., building materials, sources of fuel) of Earth's materials based on their properties. • Identify Earth's materials that are used as fuel, and other ways that humans use these materials to meet needs and wants (i.e., fluorite for toothpaste, marble for statues). • Determine and support explanations of the uses of Earth's materials (e.g., best soils to grow plants, best building material for a specific purpose, determining which rock size will best prevent erosion).

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ESS3.A Natural resources	Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do *K-ESS2-1Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.* *Continued from page 16*	Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not. *4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.* *Continued from page 16*	Earth's Resources Caring for Earth's Resources	ESS.7.4A: By the end of Grade 4, students will explain that the supply of many resources is limited, and that resources can be extended through recycling and decreased use.	• Describe various resources that provide the necessary things that are used by people in their daily living. • Identify resources we get from the living and nonliving environment and that resources are necessary to meet the needs and wants of a population. • Observe and describe ways humans use Earth's materials (e.g., soil, rocks) in daily life. • Distinguish between and provide examples of materials that can be recycled/reused and those that cannot. • Describe how some resources can be used and reused. • Explain that the supply of many resources is limited but the supply can be extended through careful use, decreased use, reusing and/or recycling. • Explain that the supply of many non-renewable resources is limited and can be extended through reducing, reusing and recycling but cannot be

					extended indefinitel • Describe ways Earth's renewable resources (e.g., fresh water, air, wildlife and trees) can be maintained

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ESS3.A Natural resources	Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do *K-ESS2-1Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.* *Continued from page 17*	Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not. *4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.* *Continued from page 17*	Uses of Earth's Materials	ESS.3.4B By the end of Grade 4, students will explain how their characteristics of various earth materials lend themselves to specific uses	• Identify the composition of Earth (including rocks, sand, soil, and water). • Identify which materials are best for different uses (e.g., soils for growing plants, sand for the sand box.) • Identify different uses (e.g., building materials, sources of fuel) of Earth's materials based on their properties • Identify Earth's materials that are used as fuel, and other ways that humans use these materials to meet needs and wants (i.e., fluorite for toothpaste, marble for statues). • Determine and support explanations of the uses of Earth's materials (e.g., best soils to grow plants, best building material for a specific purpose, determining which rock size will best

					prevent erosion).

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ESS3.B Natural hazards	In a region, some kinds of severe weather are more likely than others. Forecasts allow communities to prepare for severe weather. *K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*	A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts *3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard* *4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans*	Weather Using Tools to Gather Data About Weather Earth's Resources Caring for Earth's Resources	ESS.6.4A: By the end of Grade 4, students will collect daily weather observation and describe weather changes or weather pattern based on data collected. ESS.6.4B: By the end of Grade 4, students will explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches). ESS.7.4A: By the end of Grade 4, students will explain that the supply of many resources is limited, and that resources can be extended through recycling and decreased	• Describe how weather and forecasts affect people's lives. • Observe, identify and record changes in weather and effects on living organisms. • Describe how weather and forecasts affect people's lives. • Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs.

				use.	picking up trash, hunting/conservation of species, paving/restoring greenspace).

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ESS3.C Human impacts on Earth systems	Things people do can affect the environment but they can make choices to reduce their impacts. *K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment*	Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments. *ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment*	Earth's Resources Caring for Earth's Resources	ESS.7.4A: By the end of Grade 4, students will explain that the supply of many resources is limited, and that resources can be extended through recycling and decreased use.	• Distinguish between and provide examples of materials that can be recycled/reused and those that cannot • Describe how some resources can be used and reused. • Explain that the supply of many resources is limited but the supply can be extended through careful use, decreased use, reusing and/or recycling. • Explain that the supply of many non-renewable resources is limited and can be extended through reducing, reusing and recycling but cannot be extended indefinitel • Describe ways Earth's renewable resources (e.g., fresh water, air, wildlife and trees) can be maintained. • Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash,

					hunting/conservation of species, paving/restoring greenspace).

Life Science

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LS1.A Structure and function	All organisms have external parts that they use to perform daily functions. *1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs*	Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction. *4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.*	Basic Needs of Living Things Structure and Function of Organisms	LS.1.4A: By the end of Grade 4, students will identify the basic needs of plants and animals in order to stay alive. (i.e., water, air, food, space).	• Observe, identify, and record external features of humans and other animals. • Identify the structures in plants (leaves, roots, flowers, stem, bark, wood) that are responsible for food production, support, water transport, reproduction, growth, and protection. • Identify the relationships between the physical structures of plants and the function of those structures (e.g., absorption of water, absorption of light energy, support, reproduction). • Identify the relationships between the physical structures of animals and the function of those structures

					(e.g., taking in water, support, movement, obtaining food, reproduction).

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LS1.A Structure and function	All organisms have external parts that they use to perform daily functions. *1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs* *Continued from page 21*	Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction. *4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.* *Continued from page 21*	Classification of Living Things	LS.1.4B: By the end of Grade 4, students will sort/classify different living things using similar and different characteristics. Describe why organisms belong to each group or cite evidence about how they are alike or not alike.	• Sort animals and plants by observable characteristics. • Identify and compare the physical structures of a variety of plants (e.g., stem, leaves, flowers, seeds, roots)> • Identify and compare the physical structures of a variety of animals (e.g., sensory organs, beaks, appendages, body covering) • Identify the relationships between the physical structures of animals and the function of those structures (e.g., taking in water, support, movement, obtaining food, reproduction). • Identify the relationships between the physical structures of plants and the function of those structures (e.g., absorption of water, absorption of light energy, support, reproduction).
			Needs and Survival of Living things	LS.2.4A: By the end of Grade 4, students will identify the basic needs of plants and animals in order	• Associate specific structures with their functions in the survival of

				to stay alive (i.e., water, air, food, space).	an organism.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS1.B Growth and development of organisms	Parents and offspring often engage in behaviors that help the offspring survive. *1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive*	Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles. *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.*	Life Cycles/Reproduction	LS.4.4A: By the end of Grade 4, students will predict, sequence or compare the life stages of organisms – plants and animals (e.g., put images of life stages of an organism in order, predict the next stage in sequence, compare two organisms).	• Describe the major stages that characterize the life cycle of the frog and butterfly as they go through metamorphosis. • Sequence the life cycle of a plant or animal when given a set of pictures. • Recognize that plants and animals go through predictable life cycles that include birth, growth, development, reproduction, and death • Compare the life cycles of different animals including birth to adulthood, reproduction and death (e.g., egg-tadpole-frog, egg-caterpillar-chrysalis-butterfly). • Compare the life cycles of different plants including germination, maturity, reproduction and death. • Describe plant development and growth. • Illustrate complete metamorphosis (e.g., butterfly, frog). • Illustrate incomplete metamorphosis (e.g.,

					grasshopper).
NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS1.B Growth and development of organisms	Parents and offspring often engage in behaviors that help the offspring survive. *1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive* *Continued from page 23*	Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles. *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.* *Continued from page 23*	Life Cycles/Reproduction	LS.4.4A: By the end of Grade 4, students will predict, sequence or compare the life stages of organisms – plants and animals (e.g., put images of life stages of an organism in order, predict the next stage in sequence, compare two organisms).	• Compare and contrast complete metamorphosis and incomplete metamorphosis. • Differentiate among complete metamorphosis, incomplete metamorphosis, and embryonic development. • Illustrate embryonic development (e.g., chicken). • Compare and contrast embryonic development and incomplete metamorphosis

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS1.C Organization for matter and energy flow in organisms	Animals obtain food they need from plants or other animals. Plants need water and light. *LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive*	Food provides animals with the materials and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter and obtain energy from sunlight, which is used to maintain conditions necessary for survival. *5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, 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*	Basic Needs of Living Things Structure and Function of Organisms What Drives the Water Cycle	LS.1.4A: By the end of Grade 4, students will identify the basic needs of plants and animals in order to stay alive. (i.e., water, air, food, space). ESS.5.4A: By the end of Grade 4, students will provide evidence showing that the sun is the source of heat and light for Earth and is essential for plant growth	• Identify the basic needs of most animals (i.e., air, water, food, shelter). • Observe that animals need water, air, food, and shelter/space to grow and reproduce. • Identify the basic needs of most plants (i.e., air, water, light). • Predict and investigate the growth of plants when growing conditions are altered (e.g., dark vs. light, water vs. no water). • Investigate and describe how living things grow and change. • Investigate and report how sunlight affects plant growth.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS1.C Organization for matter and energy flow in organisms	Animals obtain food they need from plants or other animals. Plants need water and light. *LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive* *Continued from page 25*	Food provides animals with the materials and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter and obtain energy from sunlight, which is used to maintain conditions necessary for survival. *5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, 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* *Continued from page 25*	Needs and Survival of Living things	LS.2.4A: By the end of Grade 4, students will identify the basic needs of plants and animals in order to stay alive (i.e., water, air, food, space).	• Identify basic needs of plants and animals: Food, water, light, air, space. • Investigate and explain that plants need light energy from the sun to make food, while animals need to eat plants and/or other animals as their food. • Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS1.D Information Processing	Animals sense and communicate information and respond to inputs with behaviors that help them grow and survive. *1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs*	Different sense receptors are specialized for particular kinds of information; Animals use their perceptions and memories to guide their actions. *3-LS2-1. Construct an argument that some animals form groups that help members survive.* *4-LS1-2. Use a model to describe that animals' receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.*	Basic Needs of Living Things Structure and Function of Organisms Needs and Survival of Living things	LS.1.4A: By the end of Grade 4, students will identify the basic needs of plants and animals in order to stay alive. (i.e., water, air, food, space). LS.2.4A: By the end of Grade 4, students will identify the basic needs of plants and animals in order to stay alive (i.e., water, air, food, space).	• Investigate and describe how plants and animals have features that help them live in various environments. • Explain that all living things have structures that provide the basic needs for survival.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS2.A Interdependent relationships in ecosystems	Plants depend on water and light to grow, and also depend on animals for pollination or to move their seeds around. *2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow* *2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants*	The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil. *5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.*	Source of Energy for Living Things Flow of Energy In An Ecosystem Interactions among Organisms and their Environment	LS.2.4B: By the end of Grade 4, students will explain that energy is needed for all organisms to stay alive and grow and identify where a plant or animal gets its energy. LS.3.4A: By the end of Grade 4, students will describe ways plants and animals depend on each other (e.g., shelter, nesting, food).	• Describe how all animals depend upon plants whether or not they eat the plants directly. • Differentiate between the needs of plants and those of animals. • Explain that all organisms require a form of energy to survive and that humans and other animals obtain energy and materials from food. • Categorize organisms as predator or prey in a given ecosystem • Act out or construct simple diagrams (pictures or words) that shows a simple food web • Use information about a simple food web to determine how basic needs (e.g. shelter and water) are met by the habitat/environment • Demonstrate in a food web that all animals' food begins with the sun. • Explain the way that plants and animals in a habitat

					depend on each other.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS2.B Cycles of matter and energy transfer in ecosystems	[Content found in LS1.C and ESS3.A]	Matter cycles between the air and soil and among organisms as they live and die. *5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment*			•

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS2.C Ecosystem dynamics, functioning, and resilience	N/A	When the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. *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*	Natural Selection	LS.5.4A: By the End of Grade 4, students will identify and explain how the physical structures of an organism (plants or animals) allow it to survive in its habitat/environment (e.g., roots for water; nose to smell fire).	• Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). • Give examples of how inherited characteristics may change over time as adaptations to changes in the environment that enable organisms to survive, • Describe plant behaviors, such as the way seedlings' stems grow toward light and their roots grow downward in response to gravity.
			Interactions among Organisms and their Environment	LS.3.4A: By the end of Grade 4, students will describe ways plants and animals depend on each other (e.g., shelter, nesting, food).	• Describe how people and other animals interact with the environment through their senses of sight, hearing, touch, smell, and taste. • Identify examples where human activity has had a beneficial or harmful effect on other organisms (e.g., feeding birds, littering vs. picking up trash,

					hunting/conservation of species, paving/restoring greenspace).

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS3.A Inheritance of traits LS3.B Variation of traits	Young organisms are very much, but not exactly, like their parents and also resemble other organisms of the same kind *1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents*	Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops *3-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.* *3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment*	Inheritance	LS.4.4B: By the end of Grade 4, students will distinguish between characteristics of humans that are inherited from parents (i.e., hair color, height, skin color, eye color) and others that are learned (e.g., riding a bike, singing a song, playing a game, reading).	• Describe how plants and animals usually resemble their parents. • Investigate and describe how particular plants have seeds that produce the same kind of plant. • Investigate and describe how particular animals have offspring that are the same kind of animal. • Identify likenesses between parents and offspring (e.g., eye color, flower color) that are inherited. • Explain that others likenesses, such as table manners are learned. • Explain that every organism requires a set of instructions that specifies its traits. • Heredity is the passage of these instructions from one generation to another.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS2.D Social interactions and group behavior	N/A	Being part of a group helps animals obtain food, defend themselves, and cope with changes	Interactions among Organisms and their Environment	LS.3.4A: By the end of Grade 4, students will describe ways plants and animals depend on each other (e.g., shelter, nesting, food).	• Identify the ways a specific organism may interact with other organisms or with the environment (e.g., pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism). • Investigate and describe the roles of plants as producers and animals as consumers and how living things may depend on each other.
LS4.A Evidence of common ancestry and diversity	N/A	Some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago. *3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago*	Fossils	ESS.3.4A By the end of Grade 4, Students will use physical properties to sort, classify, and describe earth materials (soils, rocks or minerals).	• Identify types of fossils (including molds, casts, and preserved parts of plants and animals). • Identify features of fossils that can be used to compare them to living organisms that are familiar. • Explain how fossils can be used to make inferences about past life, climate, geology, and environments. • Cite two scientific explanations for the extinction of dinosaurs and their prehistoric organisms.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS4.B Natural selection	N/A	Differences in characteristics between individuals of the same species provide advantages in surviving and reproducing *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*	Basic Needs of Living Things Structure and Function of Organisms Natural Selection	LS.1.4A: By the end of Grade 4, students will identify the basic needs of plants and animals in order to stay alive. (i.e., water, air, food, space). LS.5.4A: By the End of Grade 4, students will identify and explain how the physical structures of an organism (plants or animals) allow it to survive in its habitat/environment (e.g., roots for water; nose to smell fire).	• Investigate and describe how plants and animals have features that help them live in various environments • Identify the specific functions of the physical structures of a plant or an animal (e.g. roots for water; webbed feet for swimming). • Identifying and explain how the physical structure/characteristic of an organism allows it to survive and defend itself. • Analyze the structures needed for survival of populations of plants and animals in a particular habitat/environment (e.g. populations of desert plants and animals require structures that enable them to obtain/conserve/ retain water)

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
LS4.C Adaptation	N/A	Particular organisms can only survive in particular environments *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*	Interactions among Organisms and their Environment	LS.3.4A: By the end of Grade 4, students will describe ways plants and animals depend on each other (e.g., shelter, nesting, food)	• Identify the ways in which an organism's habitat provides for its basic needs (plants require air, water, nutrients, and light; animals require food, water, air, and shelter). • Observe, record, and describe changes in the health or behavior of an organism as a result of changes in its environment. • Observe how the living things in an environment change with the seasons (e.g., trees lose their leaves in the winter).
LS4.D Biodiversity and humans	A range of different organisms lives in different places. *2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats*	Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there. *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*	Interactions among Organisms and their Environment	LS.3.4A: By the end of Grade 4, students will describe ways plants and animals depend on each other (e.g., shelter, nesting, food).	• Identify different environments (i.e., pond, forest, prairie) support the life of different types of plants and animals. • Investigate and describe how animals and plants that live in different places have similarities and differences • Use information about organisms to design a habitat and explain how the habitat provides for

		there may change			the needs of the organisms that live there

PHYSICAL SCIENCE

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS1.A Structure of matter (includes PS1.C Nuclear processes)	Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts. *2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.* *2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* *2-PS1-3. Make observations to construct an evidence-based account of how an object made of a*	Because matter exists as particles that are too small to see, matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials. *5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen* *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.*** *5-PS1-3. Make observations and measurements to identify materials*	Composition of Matter Effect of Forces	PS.1.4A: By the end of Grade 4, students will be able to collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility). PS.6.4A: By the end of Grade 4, students will use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls).	• Identify the materials that make up an object. (e.g., desk is made up of wood and metal, bike is made up of metal, rubber, and plastic) • Describe objects in terms of what they are made of and their physical properties • Compare, sort and group objects in terms of what they are made of (e.g., clay, cloth, paper, or metal) • Describe features of the object or material that are only visible with the use of the magnifier. • Use measures of weight (data) to demonstrate that the whole equals the sum of its parts. • Describe the properties of magnetism and demonstrate how magnets can be used to move some things without touching them. • Use observations of magnets in relation to other

	small set of pieces can be disassembled and made into a new object.	*based on their properties.*			objects to describe the properties of magnetism (i.e., attract or repel certain objects or has no effect).
NGSS	**Progression K to 2**	**Progression 3 to 5**	**AERO**	**Benchmark K to 4**	**AERO Performance Indicators**
PS1.A Structure of matter **(includes PS1.C Nuclear processes)**	**Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.** *2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.* *2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.*	**Because matter exists as particles that are too small to see, matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.** *5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen* *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*	**Composition of Matter**	**PS.1.4A: By the end of Grade 4, students will be able to collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).**	• Identify the observable properties of different objects, such as color, size, shape, weight and texture. • Use attributes of properties to state why objects are grouped together (e.g., things that roll, things that are rough). • Identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight). • Identify, compare, and sort objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, flexibility, odor, elasticity, length, mass, area, volume, perimeter). • Collect and organize data about physical properties in

	2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. *Continued from page 35*	*matter is* **conserved.** *5-PS1-3. Make observations and measurements to identify materials based on their properties.* *Continued from page 35*			order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).
NGSS	**Progression K to 2**	**Progression 3 to 5**	**AERO**	**Benchmark K to 4**	**AERO Performance Indicators**
PS1.A Structure of matter **(includes PS1.C Nuclear processes)**	**Matter exists as different substances that have observable different properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.** *2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.* *2-PS1-2. Analyze data obtained from testing different materials to*	**Because matter exists as particles that are too small to see, matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.** *5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen* *5-PS1-2. Measure and graph quantities to provide evidence that*	Measuring Matter	PS.1.4E: By the end of Grade 4, Students will use measures of weight (data) to demonstrate that the whole equals the sum of its parts.	• *Use non-standard units of measure (e.g., string, paper clips) to compare the size and weight of non-living materials.* • *Use simple tools (e.g. balance scale, see-saw) to explore the property of weight.* • *Use standard tools to measure objects or materials (e.g., ruler, meter stick, measuring tape, pan balance, thermometer, graduated cylinder).* • Select the appropriate metric system tools for measuring length, width, temperature, volume, and mass.

	determine which materials have the properties that are best suited for an intended purpose. *2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.* *Continued from page 36*	*regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is* ***conserved.*** *5-PS1-3. Make observations and measurements to identify materials based on their properties.* *Continued from page 36*			• Show that the weight of an object remains the same despite a change in its shape
NGSS	**Progression K to 2**	**Progression 3 to 5**	**AERO**	**Benchmark K to 4**	**AERO Performance Indicators**
PS1.B Chemical reactions	**Heating and cooling substances cause changes that are sometimes reversible and sometimes not.** *2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot*	**Chemical reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same** *5 PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs*	**States of Matter** **Changes of State**	**PS.1.4D: By the end of Grade 4, Students will make a prediction about what might happen to the state of common materials when heated or cooled and categorize materials as a solid, liquid, or gas**	• Identify matter that can be a liquid or solid (e.g., water). • Identify and compare solids (e.g. have a definite shape) and liquids (e.g. take the shape of their containers). • Investigate and recognize water can change from a liquid to a solid (freeze), and back again to a liquid (melt), as the result of temperature changes. • Compare the observable physical properties of

		when heating, cooling, or mixing substances, the total weight of matter is conserved. *5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances*			solids, liquids, or gases (air) (i.e., visible vs. invisible, changes in shape, changes in the amount of space occupied). • Make a prediction about what might happen to the state of common materials when heated or cooled; or categorize materials as solid, liquid, or gas

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS1.B Chemical reactions	**Heating and cooling substances cause changes that are sometimes reversible and sometimes not.** *2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot* *Continued from page 38*	**Chemical reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same** *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.* *5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances* *Continued from page 38*	**Physical and Chemical Changes**	**PS.2.4A:** By the end of Grade 4, students will differentiate between physical and chemical changes.	• Describe how the properties of certain materials can change when specific actions are applied to them, such as freezing, mixing, heating, cutting, dissolving and bending. • Demonstrate that when some substances combine, they may retain their individual properties (e.g. salt and pepper) and that some may lose their individual properties (e.g. powdered drink in water). • Investigate and explain that not all materials react the same way when an action is applied to them. • Differentiate between a physical change, such as melting, and a chemical change, such as rusting.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS2.A Forces and motion	**Pushes and pulls can have different strengths and directions, and can change the speed or direction of its motion or start or stop it.** *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	**The effect of unbalanced forces on an object results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.** *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.*	Magnetic Properties	PS.1.4F: By the end of Grade 4, Students will use observations of magnets in relation to other objects to describe the properties of magnetism (i.e., attract or repel certain objects or has no effect)	• Observe and sort objects that are and are not attracted to magnets. • Predict whether or not an object will be attracted to a magnet. • Describe what happens when like and opposite poles of a magnet are placed near each other. • Describe the physical properties of magnets. • Determine the relative strength of various magnets (e.g. size, number of paper clips attracted, etc.)
PS2.B Types of interactions			Motion (macroscopic)	PS.5.4A: By the end of Grade 4, students will describe an object's change in position relative to other objects or background.	• Describe spatial relationships (i.e., above, below, next to, left, right, middle, center) of objects. • Describe the ways things can be made to move (e.g. straight, zigzag, up and down, round and round, back and forth, or fast and slow). • Describe an objects position by locating it relative to another 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* *3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.* *5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.*			or the background. • Demonstrate a variety of ways to make things move and describe what causes them to change speed, direction and/or stop. • Describe an objects motion by tracing and measuring its position over time. (measuring speed).

		Continued from page 40			

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS2.A Forces and motion PS2.B Types of interactions	Pushes and pulls can have different strengths and directions, and can change the speed or direction of its motion or start or stop it. *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	The effect of unbalanced forces on an object results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. *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.*	Effect of Forces	PS.6.4A: By the end of Grade 4, students will use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls).	• Describe the position of an object by referencing its location in relation to another object or background. • Describe and demonstrate how the position and motion of an object can be changed by applying force, such as pushing and pulling. • Identify contact /non-contact forces that affect motion of an object (e.g., gravity, magnetism and collision). • Explore the effects some objects have on others even when the two objects might not touch (e.g., magnets). • Explain that electrically charged material pulls on all other materials and can attract or repel other charged materials • Describe the ways that different objects may balance or topple in various situations. • Describe and demonstrate that things close to the Earth drop to the ground

		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* *3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.* *5-PS2-1. Support an argument that the gravitational force exerted by Earth on*			unless something supports them. • Assemble, take apart, and reassemble constructions using interlocking blocks, erector sets, etc. • Manipulate hammers and nails, screwdrivers and screws, scissors, and other simple tools. • Examine simple machines and the forces (pushes and pulls) involved. • Perform experiments with simple machines to demonstrate the relationship between forces and distance. • Illustrate quantitatively mechanical advantage of simple machines.

		objects is directed down. *Continued from page 42*			

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS3.A Definitions of energy	N/A	Moving objects contain energy. The faster the object moves, the more energy it has. Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents. Energy can be converted from one form to another form. *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.*	Forms of Energy	PS.3.4A: By the end of Grade 4, students will predict the observable effects of energy (i.e., light bulb lights, a bell rings, hands warm up) when given a specific example or illustration (e.g., simple closed circuit, rubbing hands together), (e.g., a test item might ask, "what will happen when…?").	• Observe how energy does things (e.g., batteries, the sun, wind, electricity). • Explain that energy comes from different sources, such as electricity and water, and is utilized in many common objects. • Describe how energy produces changes (e.g., heat melts ice, gas makes car go uphill, electricity makes TV work). • Identify the various forms of energy, such as electrical, light, heat, sound and explain that these forms of energy can affect common objects and are involved in common events. • Describe the usefulness of some forms of energy (e.g., electricity, sunlight, wind, sound) and how energy (e.g., heat, light,) can affect common objects (e.g., sunlight warms dark objects, heat melts candles).

PS3.A Definitions of energy	N/A	*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* *Continued from page 44*	Electricity and Transformation of Energy	PS.4.4A: By the end of Grade 4, students will demonstrate and explain the movement of electricity in closed and open circuits	• Identify the use of electricity. • Construct and explain a simple electric circuit. • Demonstrate that electricity flowing in circuits can produce light, heat, sound, and magnetic • Classify a variety of materials on whether they conduct electricity (conductors) or do not conduct electricity (insulators)
	N/A		Heat Energy	PS.3.4B: By the end of Grade 4, students will experiment, observe, or predict how heat might move from one object to another.	• Classify objects in terms of their relative temperature (e.g., hotter and colder). • Identify some examples where heat is released (e.g., burning candles, rubbing hands, running). • Describe that heat can be produced (e.g., burning, rubbing, mixing some substances). • Explain that thermal energy (heat) moves more rapidly in thermal conductors (e.g., metal pan) than in insulators (e.g., plastic handle). • Describe the effectiveness

					of different insulating and conducting materials with respect to thermal energy (heat) flow.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS3.B Conservation of energy and energy transfer	[Content found in PS3.D] *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.*		Light Energy	PS.3.4D: By the end of Grade 4, Students will use observations of light in relation to other objects/substances to describe the properties of light (can be reflected, refracted, or absorbed).	• Describe the effects of the sun's energy on different materials. • Identify the sun as the main source of the Earth's light and heat energy. • Compare the heating and cooling rates of air, land, and water. • Analyze data to explain the heating and cooling rates of air, land, and water. • Describe how the Sun, a major energy source for the Earth, affects the planet's surface.
			Heat Energy	PS.3.4B: By the end of Grade 4, students will experiment, observe, or predict how heat might move from one object to another.	• Classify a variety of materials as those that can reflect or absorb light.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS3.C Relationship between energy and forces	Bigger pushes and pulls cause bigger changes in an object's motion or shape. *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*	When objects collide, contact forces transfer energy so as to change the objects' motions. *4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide*	Effect of Forces	**PS.6.4A:** By the end of Grade 4, students will use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls).	• Compare the effects of force (pushes or pulls) on the motion of an object. • Explain that the strength of a force and mass of an object influence the amount of change in an object's motion. • Describe the effect of retarding forces such as friction on the motion of objects. • Describe the effects of variables on an object's motion (e.g., incline angle, friction, gravity, applied forces).

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS3.D Energy in chemical processes and everyday life	Sunlight warms Earth's surface. *K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface*	Energy can be "produced," "used," or "released" by converting stored energy. Plants capture energy from sunlight, which can later be used as fuel or food. *4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another* *5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.*	Light Energy	PS.3.4D: By the end of Grade 4, Students will use observations of light in relation to other objects/substances to describe the properties of light (can be reflected, refracted, or absorbed).	• Describe the effects of the sun's energy on different materials. • Identify the sun as the main source of the Earth's light and heat energy. • Compare the heating and cooling rates of air, land, and water. • Analyze data to explain the heating and cooling rates of air, land, and water. • Describe how the Sun, a major energy source for the Earth, affects the planet's surface. •

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS4.A Wave properties	Sound can make matter vibrate, and vibrating matter can make sound. *1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.*	Waves are regular patterns of motion, which can be made in water by disturbing the surface. Waves of the same type can differ in amplitude and wavelength. Waves can make objects move. *4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move*	Sound Energy	PS.3.4C: By the end of Grade 4, students will experiment to identify, classify, and change different pitches and volumes of sounds produced by different objects.	• Demonstrate and identify sounds as soft or loud. • Demonstrate how sound is made in a variety of ways (e.g., singing, whispering, striking an object). • Demonstrate how sound can change in pitch and volume. • Compare and contrast the change in length, tension, or thickness of a vibrating object on the frequency of vibration (e.g., string, wire, or rubber band). • Demonstrate that the pitch of a sound is dependent on the frequency of the vibration producing it.

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS4.B Electromagnetic radiation	Objects can be seen only when light is available to illuminate them. *1-PS4-2. Make observations to construct an evidence-based account that objects can be seen only when illuminated.* ***1-PS4-3. Plan and** conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.*	Object can be seen when light reflected from their surface enters our eyes. *4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen*	Light Energy	PS.3.4D: By the end of Grade 4, Students will use observations of light in relation to other objects/substances to describe the properties of light (can be reflected, refracted, or absorbed).	• Identify natural sources of light (e.g., sun, fireflies, deep sea creatures, fire, lightning) and artificial sources of light (e.g., light bulbs, matches, candles). • Observe and record shadows at different times of the day. • Investigate the properties of transparent and opaque objects (e.g., plastic wrap and aluminum foil). • Describe how light can be reflected by a mirror, bent by a lens, or absorbed by the object. • Describe ways light can interact with matter, such as transmission (which includes refraction), absorption, and scattering (which includes reflection).

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
PS4.C Information technologies and instrumentation	People use devices to send and receive information. *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*	Patterns can encode, send, receive and decode information. *4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.*			•

Engineering Design

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
ETS1.A: Defining and Delimiting Engineering Problems	**A situation that people want to change or create can be approached as a problem to be solved through engineering.** (K-2- ETS1-1) Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	**Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.** (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.	☐		•

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
ETS1.A: Defining and Delimiting Engineering Problems Continued from page 53	**Asking questions, making observations, and gathering information are helpful in thinking about problems.** (K-2- ETS1-1) Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.				•
	Before beginning to design a solution, it is important to clearly understand the problem. (K-2- ETS1-1) Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be				•

	solved through the development of a new or improved object or tool				
NGSS	**Progression K to 2**	**Progression 3 to 5**	**AERO**	**Benchmark K to 4**	**AERO Performance Indicators**
ETS1.B: Developing Possible Solutions	**Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.** (K-2-ETS1-2) Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	**Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.** (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.			•
		At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead			•

		to improved designs. (3-5-ETS1-2) See above			
NGSS	**Progression K to 2**	**Progression 3 to 5**	**AERO**	**Benchmark K to 4**	**AERO Performance Indicators**
ETS1.B: Developing Possible Solutions **Continued from page 55**		Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) ETS1.C: 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.			•
ETS1.C: Optimizing the Design Solution	**Because there is always more than one possible solution to a problem, it is useful to compare and test designs.** (K-2-ETS1-3) Analyze data from	Optimizing the Design Solution Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the			•

	tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	constraints. (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			

Science and Engineering Practices (STEM)

From publication: A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (NRC 2011)

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
1. Asking questions (science) and defining problems (engineering)	**Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.** Ask questions based on observations to find more information about the designed world. (K-ESS3-2) (K-2- ETS1-1) Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2- ETS1-1)	**Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.** Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) (4-PS3-3) Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4)			•

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
2. Developing and using models	**Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.** Use a model to represent relationships in the natural world. (K-ESS3-1) (2-ESS2-2) Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) (K-2-ETS1-2)	Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop models to describe phenomena. (3-LS1-1) (4-PS4-2) (5-PS1-1) (5-PS3-1) (5-LS2-1) Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4- 1). (5-ESS2-1)			•

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
3. Planning and carrying out investigations ▯	**Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.** With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1 Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) (1-ESS1-2) (2-LS4-1) Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1) (1-PS4-3) (2-PS1-1) (2-LS2-1)	**Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered (3-PS2-1). (5-PS1-4) Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2) (4-PS3-2) (4-ESS2-1) (5-PS1-3)			•

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
4. Analyzing and interpreting data	**Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.** Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) (K-ESS2-1 (1- ESS1-1) Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2) (2-PS1-2) (K-2-ETS1-3)	**Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.** Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) (3-LS4-1) (4-ESS2-2) Represent data in tables and various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (3-ESS2-1) (5-ESS1-2)			•

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
5. Using mathematics and computational thinking		**Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.** Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS2-2) Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)			•

NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
6. Constructing explanations (science) and designing solutions(engineering)	Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3- 2) (1-PS4-4) Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1- PS4-2) (1-LS3-1) (2-PS1-3) (2-ESS1-1) Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)	Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems Apply scientific ideas to solve design problems. (3-PS2-4) (4- PS3-4) Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) (3-LS4-2) (4-PS3-1) (4-ESS1-1) Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3) (4-ESS3-2)			•

	Compare multiple solutions to a problem. (2-ESS2-1)				
NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
7. Engaging in argument from evidence	**Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).** Construct an argument with evidence to support a claim. (K-ESS2-2) (2- PS1-4)	**Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds.** Construct an argument with evidence, data, and/or a model. (3-LS2-1) (4-LS1-1) (5- PS2-1) (5-LS1-1) (5- ESS1-1) Construct an argument with evidence. (3-LS4-3) Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4) (3-ESS3-1)			•

		Use a model to test interactions concerning the functioning of a natural system. (4-LS-1-2) .			
NGSS	Progression K to 2	Progression 3 to 5	AERO	Benchmark K to 4	AERO Performance Indicators
8. Obtaining, evaluating, and communicating information	Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2) (1-LS1-2) Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3) Obtain information using various texts, text features	**Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.** Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2) (4-ESS3-1) Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)			•

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