

Virginia Science Standards of Learning (2010)	ESS Presentations
Kindergarten	
Scientific Investigation, Reasoning, and Logic	
<b>K.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</b>	
a) basic characteristics or properties of objects are identified by direct observation;	Marvellous Materials Materials Matter Changing Materials Senses
b) observations are made from multiple positions to achieve different perspectives;	
c) a set of objects is sequenced according to size;	
d) a set of objects is separated into two groups based on a single physical characteristic;	Marvellous Materials Materials Matter Changing Materials
e) nonstandard units are used to measure the length, mass, and volume of common objects;	
f) observations and predictions are made for an unseen member in a sequence of objects;	Materials Matter
g) a question is developed and predictions are made from one or more observations;	Mysterious Magnets Hot and Cold Living Things
h) observations are recorded;	Hot and Cold
i) picture graphs are constructed;	Senses
j) unusual or unexpected results in an activity are recognized; and	
k) objects are described both pictorially and verbally.	Marvellous Materials Materials Matter Changing Materials Living Things Animals and Plants Growing Up Light and Dark Hot and Cold Senses Feel the Force

K-2 Product

3-5 Product

<b>K.2 The student will investigate and understand that humans have senses that allow them to seek, find, take in, and react or respond to information in order to learn about their surroundings. Key concepts include</b>	
a) the five senses and corresponding sensing organs; and	
b) sensory descriptors used to describe common objects and phenomena.	Senses
<b>Force, Motion, and Energy</b>	
<b>K.3 The student will investigate and understand that magnets have an effect on some materials, make some things move without touching them, and have useful applications. Key concepts include</b>	
a) magnetism and its effects; and	Mysterious Magnets
b) useful applications of magnetism.	Mysterious Magnets
<b>Matter</b>	
<b>K.4 The student will investigate and understand that the position, motion, and physical properties of an object can be described. Key concepts include</b>	
a) colors of objects;	Materials Matter Marvellous Materials Changing Materials
b) shapes and forms of objects;	Materials Matter Marvellous Materials Changing Materials
c) textures and feel of objects;	Materials Matter Marvellous Materials Changing Materials
d) relative sizes and weights of objects; and	
e) relative positions and speed of objects.	Feel the Force
<b>K.5 The student will investigate and understand that water flows and has properties that can be observed and tested. Key concepts include</b>	
a) water occurs in different phases;	Hot and Cold
b) water flows downhill; and	
c) some materials float in water, while others sink.	
<b>Life Processes</b>	
<b>K.6 The student will investigate and understand the differences between living organisms and nonliving objects. Key concepts include</b>	
a) all things can be classified as living or nonliving; and	Living Things

b) living organisms have certain characteristics that distinguish them from nonliving objects including growth, movement, response to the environment, having offspring, and the need for food, air, and water.	Living Things
<b>K.7 The student will investigate and understand basic needs and life processes of plants and animals. Key concepts include</b>	
a) animals need adequate food, water, shelter, air, and space to survive;	Living Things
b) plants need nutrients, water, air, light, and a place to grow to survive;	Living Things Growing Plants
c) plants and animals change as they grow, have varied life cycles, and eventually die; and	Animals and Plants Growing Up Growing Plants
d) offspring of plants and animals are similar but not identical to their parents or to one another.	Growing Up Growing Plants
<b>Interrelationships in Earth/Space Systems</b>	
<b>K.8 The student will investigate and understand that shadows occur when light is blocked by an object. Key concepts include</b>	
a) shadows occur in nature when sunlight is blocked by an object; and	Shadows Light and Dark
b) shadows can be produced by blocking artificial light sources.	Shadows
<b>Earth Patterns, Cycles, and Change</b>	
<b>K.9 The student will investigate and understand that there are simple repeating patterns in his/her daily life. Key concepts include</b>	
a) weather observations;	Weather
b) the shapes and forms of many common natural objects including seeds, cones, and leaves; and	Animals and Plants Growing Up Growing Plants
c) animal and plant growth.	Growing Up Growing Plants
<b>K.10 The student will investigate and understand that change occurs over time and rates may be fast or slow. Key concepts include</b>	
a) natural and human-made things may change over time; and	Changing Materials Growing Up Growing Plants Living Things

b) changes can be observed and measured.	Changing Materials Growing Up Growing Plants Living Things
<b>Earth Resources</b>	
<b>K.11 The student will investigate and understand that materials can be reused, recycled, and conserved. Key concepts include</b>	
a) materials and objects can be used over and over again;	Pollution
b) everyday materials can be recycled; and	Pollution
c) water and energy conservation at home and in school helps ensure resources are available for future use.	Pollution
<b>Grade One</b>	
<b>Scientific Investigation, Reasoning, and Logic</b>	
<b>1.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</b>	
a) the senses are used to observe differences in physical properties;	Senses
b) observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy;	
c) objects or events are classified and arranged according to characteristics or properties;	Marvellous Materials Materials Matter Changing Materials Animals and Plants
d) simple tools are used to enhance observations;	
e) length, mass, volume, and temperature are measured using nonstandard units;	
f) inferences are made and conclusions are drawn about familiar objects and events;	Materials Matter Hot and Cold Senses Animals and Plants
g) a question is developed from one or more observations;	Growing Plants Soil Mysterious Magnets Hot and Cold Living Things Growing Plants Shadows

h) predictions are made based on patterns of observations;	Mysterious Magnets Hot and Cold Living Things Growing Plants Shadows
i) observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; and	Hot and Cold Springs Senses Materials Matter Growing Plants Rocks
j) simple investigations and experiments are conducted to answer questions.	Hot and Cold Materials Matter Senses Springs Growing Plants Rocks Soil Living Things
<b>Force, Motion, and Energy</b>	
<b>1.2 The student will investigate and understand that moving objects exhibit different kinds of motion. Key concepts include</b>	
a) objects may have straight, circular, and back-and-forth motions;	Feel the Force
b) objects may vibrate and produce sound; and	Senses
c) pushes or pulls can change the movement of an object.	Feel the Force
<b>Matter</b>	
<b>1.3 The student will investigate and understand how different common materials interact with water. Key concepts include</b>	
a) some liquids will separate when mixed with water, but others will not;	
b) some solids will dissolve in water, but others will not; and	Separating Mixtures
c) some substances will dissolve more readily in hot water than in cold water.	
<b>Life Processes</b>	
<b>1.4 The student will investigate and understand that plants have basic life needs and functional parts and can be classified according to certain characteristics. Key concepts include</b>	

a) plants need nutrients, air, water, light, and a place to grow;	Living Things Growing Plants
b) basic parts of plants; and	Growing Plants Animals and Plants
c) plants can be classified based on a variety of characteristics.	Animals and Plants
<b>1.5 The student will investigate and understand that animals, including humans, have basic needs and certain distinguishing characteristics. Key concepts include</b>	
a) basic needs include adequate air, food, water, shelter, and space (habitat);	Living Things
b) animals, including humans, have many different physical characteristics; and	Animals and Plants
c) animals can be classified according to a variety of characteristics.	Animals and Plants
<b>Interrelationships in Earth/Space Systems</b>	
<b>1.6 The student will investigate and understand the basic relationships between the sun and Earth. Key concepts include</b>	
a) the sun is the source of energy and light that warms the land, air, and water; and	Weather Light and Dark Shadows
b) the sun's relative position in the morning is east and in the late afternoon is west.	Shadows
<b>Earth Patterns, Cycles, and Change</b>	
<b>1.7 The student will investigate and understand weather and seasonal changes. Key concepts include</b>	
a) changes in temperature, light, and precipitation affect plants and animals, including humans;	Weather
b) there are relationships between daily and seasonal changes; and	Weather
c) changes in temperature, light, and precipitation can be observed and recorded over time.	Weather
<b>Earth Resources</b>	
<b>1.8 The student will investigate and understand that natural resources are limited. Key concepts include</b>	
a) identification of natural resources;	Pollution Changing Materials
b) factors that affect air and water quality; and	Pollution
c) recycling, reusing, and reducing consumption of natural resources.	Pollution
<b>Grade Two</b>	
<b>Scientific Investigation, Reasoning, and Logic</b>	

<b>2.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</b>	
a) observations and predictions are made and questions are formed;	Mysterious Magnets Hot and Cold Living Things Growing Plants Shadows
b) observations are differentiated from personal interpretation;	Hot and Cold Growing Plants Materials Matter
c) observations are repeated to ensure accuracy;	
d) two or more characteristics or properties are used to classify items;	Materials Matter
e) length, volume, mass, and temperature are measured in metric units and standard English units using the proper tools;	
f) time is measured using the proper tools;	Soil
g) conditions that influence a change are identified and inferences are made;	Hot and Cold Senses Springs Growing Plants Shadows
h) data are collected and recorded, and bar graphs are constructed using numbered axes;	Hot and Cold Springs Growing Plants Senses
i) data are analyzed, and unexpected or unusual quantitative data are recognized;	
j) conclusions are drawn;	Materials Matter Hot and Cold Senses Springs Growing Plants Rocks

	Materials Matter Hot and Cold Senses Springs Growing Plants Rocks
k) observations and data are communicated;	
l) simple physical models are designed and constructed to clarify explanations and show relationships; and	Senses
m) current applications are used to reinforce science concepts.	
<b>Force, Motion, and Energy</b>	
<b>2.2 The student will investigate and understand that natural and artificial magnets have certain characteristics and attract specific types of metals. Key concepts include</b>	
a) magnetism, iron, magnetic/nonmagnetic, poles, attract/repel; and	Magnets
b) important applications of magnetism.	Mysterious Magnets Magnets
<b>Matter</b>	
<b>2.3 The student will investigate and understand basic properties of solids, liquids, and gases. Key concepts include</b>	
a) identification of distinguishing characteristics of solids, liquids, and gases;	Changing State
b) measurement of the mass and volume of solids and liquids; and	Changing State
c) changes in phases of matter with the addition or removal of energy.	Changing State
<b>Life Processes</b>	
<b>2.4 The student will investigate and understand that plants and animals undergo a series of orderly changes as they mature and grow. Key concepts include</b>	
a) animal life cycles; and	Growing Up
b) plant life cycles.	Growing Plants Plant Reproduction
<b>Living Systems</b>	
<b>2.5 The student will investigate and understand that living things are part of a system. Key concepts include</b>	
a) living organisms are interdependent with their living and nonliving surroundings;	Living Things Habitats
b) an animal's habitat includes adequate food, water, shelter or cover, and space;	Living Things Habitats

c) habitats change over time due to many influences; and	Habitats
d) fossils provide information about living systems that were on Earth years ago.	Fossils
<b>Interrelationships in Earth/Space Systems</b>	
<b>2.6 The student will investigate and understand basic types, changes, and patterns of weather. Key concepts include</b>	
a) identification of common storms and other weather phenomena;	Weather
b) the uses and importance of measuring, recording, and interpreting weather data; and	Weather
c) the uses and importance of tracking weather data over time.	
<b>Earth Patterns, Cycles, and Change</b>	
<b>2.7 The student will investigate and understand that weather and seasonal changes affect plants, animals, and their surroundings. Key concepts include</b>	
a) effects of weather and seasonal changes on the growth and behavior of living things; and	Weather Adaptations
b) weathering and erosion of land surfaces.	Erosion, Transportation and Deposition
<b>Earth Resources</b>	
<b>2.8 The student will investigate and understand that plants produce oxygen and food, are a source of useful products, and provide benefits in nature. Key concepts include</b>	
a) important plant products are identified and classified;	Growing Plants
b) the availability of plant products affects the development of a geographic area;	
c) plants provide oxygen, homes, and food for many animals; and	
d) plants can help reduce erosion.	
<b>Grade Three</b>	
<b>Scientific Investigation, Reasoning, and Logic</b>	
<b>3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</b>	
a) observations are made and are repeated to ensure accuracy;	
b) predictions are formulated using a variety of sources of information;	Separating Mixtures Circuits
c) objects with similar characteristics or properties are classified into at least two sets and two subsets;	

d) natural events are sequenced chronologically;	Erosion, Transportation and Deposition Water Cycle Days and Seasons The Moon Plant Reproduction
e) length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques;	Changing State Soil Springs
f) time is measured to the nearest minute using proper tools and techniques;	
g) questions are developed to formulate hypotheses;	Separating Mixtures Friction Circuits
h) data are gathered, charted, graphed, and analyzed;	Friction Forces
i) unexpected or unusual quantitative data are recognized;	
j) inferences are made and conclusions are drawn;	Insulators and Conductors Separating Mixtures Friction Plant Reproduction Days and Seasons
k) data are communicated;	Insulators and Conductors Separating Mixtures Friction Plant Reproduction Days and Seasons Forces
l) models are designed and built; and	
m) current applications are used to reinforce science concepts.	
<b>Force, Motion, and Energy</b>	
<b>3.2 The student will investigate and understand simple machines and their uses. Key concepts include</b>	
a) purpose and function of simple machines;	
b) types of simple machines;	
c) compound machines; and	
d) examples of simple and compound machines found in the school, home, and work environments.	

<b>Matter</b>	
<b>3.3 The student will investigate and understand that objects are made of materials that can be described by their physical properties. Key concepts include</b>	
a) objects are made of one or more materials;	
b) physical properties remain the same as the material is changed in visible size; and	
c) visible physical changes are identified.	
<b>Life Processes</b>	
<b>3.4 The student will investigate and understand that adaptations allow animals to satisfy life needs and respond to the environment. Key concepts include</b>	
a) behavioral adaptations; and	Adaptations
b) physical adaptations.	Adaptations
<b>Living Systems</b>	
<b>3.5 The student will investigate and understand relationships among organisms in aquatic and terrestrial food chains. Key concepts include</b>	
a) producer, consumer, decomposer;	Food Chains Interdependence
b) herbivore, carnivore, omnivore; and	
c) predator and prey.	Food Chains
<b>3.6 The student will investigate and understand that ecosystems support a diversity of plants and animals that share limited resources. Key concepts include</b>	
a) aquatic ecosystems;	Habitats
b) terrestrial ecosystems;	Habitats
c) populations and communities; and	
d) the human role in conserving limited resources.	Pollution
<b>Interrelationships in Earth/Space Systems</b>	
<b>3.7 The student will investigate and understand the major components of soil, its origin, and its importance to plants and animals including humans. Key concepts include</b>	
a) soil provides the support and nutrients necessary for plant growth;	Growing Plants
b) topsoil is a natural product of subsoil and bedrock;	
c) rock, clay, silt, sand, and humus are components of soils; and	Soil
d) soil is a natural resource and should be conserved.	
<b>Earth Patterns, Cycles, and Change</b>	

<b>3.8 The student will investigate and understand basic patterns and cycles occurring in nature. Key concepts include</b>	
a) patterns of natural events such as day and night, seasonal changes, simple phases of the moon, and tides;	Days and Seasons The Moon
b) animal life cycles; and	Growing Up
c) plant life cycles.	Plant Reproduction
<b>3.9 The student will investigate and understand the water cycle and its relationship to life on Earth. Key concepts include</b>	
a) there are many sources of water on Earth;	Water Cycle
b) the energy from the sun drives the water cycle;	Water Cycle
c) the water cycle involves several processes;	Water Cycle
d) water is essential for living things; and	
e) water on Earth is limited and needs to be conserved.	Water Cycle Pollution
<b>Earth Resources</b>	
<b>3.10 The student will investigate and understand that natural events and human influences can affect the survival of species. Key concepts include</b>	
a) the interdependency of plants and animals;	Interdependence
b) the effects of human activity on the quality of air, water, and habitat;	Pollution Habitats
c) the effects of fire, flood, disease, and erosion on organisms; and	
d) conservation and resource renewal.	Pollution
<b>3.11 The student will investigate and understand different sources of energy. Key concepts include</b>	
a) energy from the sun;	Food Chains Energy Forms
b) sources of renewable energy; and	
c) sources of nonrenewable energy.	
<b>Grade Four</b>	
<b>Scientific Investigation, Reasoning, and Logic</b>	
<b>4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</b>	

	Separating Mixtures Friction Circuits Plant Reproduction Sounds Forces Days and Seasons Gravity
a) distinctions are made among observations, conclusions, inferences, and predictions;	
b) objects or events are classified and arranged according to characteristics or properties;	Our Solar System Insulators and Conductors
c) appropriate instruments are selected and used to measure length, mass, volume, and temperature in metric units;	Changing State Soil Springs
d) appropriate instruments are selected and used to measure elapsed time;	
	Separating Mixtures Friction Circuits Plant Reproduction Sounds Forces Days and Seasons Gravity
e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources;	
f) independent and dependent variables are identified;	Forces
g) constants in an experimental situation are identified;	Forces
h) hypotheses are developed as cause and effect relationships;	
i) data are collected, recorded, analyzed, and displayed using bar and basic line graphs;	Friction Forces
j) numerical data that are contradictory or unusual in experimental results are recognized;	
k) data are communicated with simple graphs, pictures, written statements, and numbers;	Friction Forces
l) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and	
m) current applications are used to reinforce science concepts.	
<b>Force, Motion, and Energy</b>	

<b>4.2 The student will investigate and understand characteristics and interactions of moving objects. Key concepts include</b>	
a) motion is described by an object's direction and speed;	
b) changes in motion are related to force and mass;	Forces
c) friction is a force that opposes motion; and	Friction
d) moving objects have kinetic energy.	
<b>4.3 The student will investigate and understand the characteristics of electricity. Key concepts include</b>	
a) conductors and insulators;	Insulators and Conductors
b) basic circuits;	Circuits
c) static electricity;	
d) the ability of electrical energy to be transformed into light and motion, and to produce heat;	Energy Forms
e) simple electromagnets and magnetism; and	Electromagnets
f) historical contributions in understanding electricity.	
<b>Life Processes</b>	
<b>4.4 The student will investigate and understand basic plant anatomy and life processes. Key concepts include</b>	
a) the structures of typical plants and the function of each structure;	Plant Reproduction
b) processes and structures involved with plant reproduction;	Plant Reproduction
c) photosynthesis; and	
d) adaptations allow plants to satisfy life needs and respond to the environment.	Plant Reproduction
<b>Living Systems</b>	
<b>4.5 The student will investigate and understand how plants and animals, including humans, in an ecosystem interact with one another and with the nonliving components in the ecosystem. Key concepts include</b>	
a) plant and animal adaptations;	Adaptations Plant Reproduction
b) organization of populations, communities, and ecosystems and how they interrelate;	
c) flow of energy through food webs;	Food Chains
d) habitats and niches;	Habitats
e) changes in an organism's niche at various stages in its life cycle; and	
f) influences of human activity on ecosystems.	Pollution Habitats
<b>Interrelationships in Earth/Space Systems</b>	

<b>4.6 The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include</b>	
a) weather phenomena;	Predicting the Weather
b) weather measurements and meteorological tools; and	Predicting the Weather
c) use of weather measurements and weather phenomena to make weather predictions.	Predicting the Weather
<b>Earth Patterns, Cycles, and Change</b>	
<b>4.7 The student will investigate and understand the organization of the solar system. Key concepts include</b>	
a) the planets in the solar system;	Our Solar System
b) the order of the planets in the solar system; and	Our Solar System
c) the relative sizes of the planets.	Our Solar System
<b>4.8 The student will investigate and understand the relationships among Earth, the moon, and the sun. Key concepts include</b>	
a) the motions of Earth, the moon, and the sun;	Days and Seasons The Moon
b) the causes for Earth's seasons;	Days and Seasons
c) the causes for the phases of the moon;	The Moon
d) the relative size, position, age, and makeup of Earth, the moon, and the sun; and	Our Solar System
e) historical contributions in understanding the Earth-moon-sun system.	
<b>Earth Resources</b>	
<b>4.9 The student will investigate and understand important Virginia natural resources. Key concepts include</b>	
a) watersheds and water resources;	
b) animals and plants;	
c) minerals, rocks, ores, and energy sources; and	
d) forests, soil, and land.	
<b>Grade Five</b>	
<b>Scientific Investigation, Reasoning, and Logic</b>	
<b>5.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</b>	
a) items such as rocks, minerals, and organisms are identified using various classification keys;	Habitats
b) estimates are made and accurate measurements of length, mass, volume, and temperature are made in metric units using proper tools;	Changing State

c) estimates are made and accurate measurements of elapsed time are made using proper tools;	
	Separating Mixtures Friction Circuits Plant Reproduction Sounds Forces Days and Seasons Gravity
d) hypotheses are formed from testable questions;	Forces
e) independent and dependent variables are identified;	Forces
f) constants in an experimental situation are identified;	Friction Forces
g) data are collected, recorded, analyzed, and communicated using proper graphical representations and metric measurements;	Separating Mixtures Friction Circuits Plant Reproduction Sounds Forces Days and Seasons Gravity
h) predictions are made using patterns from data collected, and simple graphical data are generated;	Separating Mixtures Friction Circuits Plant Reproduction Sounds Forces Days and Seasons Gravity
i) inferences are made and conclusions are drawn;	
j) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and	
k) current applications are used to reinforce science concepts.	
<b>Force, Motion, and Energy</b>	
<b>5.2 The student will investigate and understand how sound is created and transmitted, and how it is used. Key concepts include</b>	

a) compression waves;	
b) vibration, compression, wavelength, frequency, amplitude;	Sounds
c) the ability of different media (solids, liquids, and gases) to transmit sound; and	
d) uses and applications of sound waves.	Sounds
<b>5.3 The student will investigate and understand basic characteristics of visible light and how it behaves. Key concepts include</b>	
a) transverse waves;	
b) the visible spectrum;	
c) opaque, transparent, and translucent;	Shadows
d) reflection of light from reflective surfaces; and	Reflection and Refraction
e) refraction of light through water and prisms.	Reflection and Refraction
<b>Matter</b>	
<b>5.4 The student will investigate and understand that matter is anything that has mass and takes up space; and occurs as a solid, liquid, or gas. Key concepts include</b>	
a) distinguishing properties of each phase of matter;	Changing State
b) the effect of temperature on the phases of matter;	Changing State
c) atoms and elements;	
d) molecules and compounds; and	
e) mixtures including solutions.	Separating Mixtures
<b>Living Systems</b>	
<b>5.5 The student will investigate and understand that organisms are made of one or more cells and have distinguishing characteristics that play a vital role in the organism's ability to survive and thrive in its environment. Key concepts include</b>	
a) basic cell structures and functions;	
b) classification of organisms using physical characteristics, body structures, and behavior of the organism; and	Habitats Adaptations
c) traits of organisms that allow them to survive in their environment.	Adaptations
<b>Interrelationships in Earth/Space Systems</b>	
<b>5.6 The student will investigate and understand characteristics of the ocean environment. Key concepts include</b>	
a) geological characteristics;	
b) physical characteristics; and	
c) ecological characteristics.	
<b>Earth Patterns, Cycles, and Change</b>	

<b>5.7 The student will investigate and understand how Earth's surface is constantly changing. Key concepts include</b>	
a) identification of rock types;	
b) the rock cycle and how transformations between rocks occur;	
c) Earth history and fossil evidence;	Fossils
d) the basic structure of Earth's interior;	
e) changes in Earth's crust due to plate tectonics;	
f) weathering, erosion, and deposition; and	Erosion, Transportation and Deposition
g) human impact.	Pollution