Virginia Science Standards of Learning Correlation to *PhD Science*™

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Key: Module (M), Lesson (L)

PhD Science Level 3

The Grade 3 Virginia Science Standards of Learning are partially covered by the *PhD Science* curriculum. A detailed analysis of alignment is provided in the table below.

Grade 3 Standards			**Aligned *PhD Science* Lessons**
Scientific Investigation, Reasoning, and Logic			
3.1	The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which		
a	Observations are made and are repeated to ensure accuracy.		Level 3 M1 L1–L9 Level 3 M1 L12 Level 3 M1 L14–L15 Level 3 M1 L18 Level 3 M1 L22
b	Predictions are formulated using a variety of sources of information.		Level 3 M1 L1–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29
c	Objects with similar characteristics or properties are classified into at least two sets and two subsets.		Level 3 M3 L1–L3
d	Natural events are sequenced chronologically.		Level 3 M1 L1–L3 Level 3 M1 L8–L10 Level 3 M2 L4–L8
e	Length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques.		Level 3 M1 L4–L10 Level 3 M2 L1–L2 Level 3 M3 L1–L3 Level 3 M3 L14–L15
f	Time is measured to the nearest minute using proper tools and techniques.		Level 3 M1 L4–L7
g	Questions are developed to formulate hypotheses.		Level 3 M1 L1–L3 Level 3 M1 L21–L26 Level 3 M2 L1–L2 Level 3 M3 L1–L3 Level 3 M3 L12–L13 Level 3 M4 L1–L3 Level 3 M4 L7–L8

			Level 3 M4 L18–L27
h	Data are gathered, charted, graphed, and analyzed.		Level 3 M1 L1–L17 Level 3 M1 L19–L20 Level 3 M1 L27–L29 Level 3 M2 L13–L15 Level 3 M2 L20–L21 Level 3 M4 L22–L27
i	Unexpected or unusual quantitative data are recognized.		Level 3 M1 L1–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29 Level 3 M2 L1–L8 Level 3 M2 L16–L19 Level 3 M2 L26–L28 Level 3 M3 L1–L8 Level 3 M3 L12–L20 Level 3 M3 L26–L28 Level 3 M4 L4–L18 Level 3 M4 L23–L30
j	Inferences are made and conclusions are drawn.		Level 3 M1 L16 Level 3 M2 L19 Level 5 M1 L5–L6
k	Data are communicated.		Level 3 M1 L11–L17 Level 3 M2 L13–L15 Level 3 M2 L20–L21 Level 3 M4 L22–L27
l	Models are designed and built.		Level 3 M1 L1–L3 Level 3 M1 L19–L20 Level 3 M2 L1–L3 Level 3 M2 L6–L12 Level 3 M2 L22–L28 Level 3 M3 L7–L11 Level 3 M3 L21–L28 Level 3 M4 L1–L3 Level 3 M4 L17–L18 Level 3 M4 L23–L27
m	Current applications are used to reinforce science concepts.		Level 3 M1 L1–L29 Level 3 M2 L1–L28 Level 3 M3 L1–L28 Level 3 M4 L1–L30
Force, Motion, and Energy			
3.2	The student will investigate and understand simple machines and their uses. Key concepts include		
a	Purpose and function of simple machines.		
b	Types of simple machines.		
c	Compound machines.		Level 3 M4 L10–L14 Level 3 M4 L17–L22
d	Examples of simple and compound machines found in the school, home, and work environments.		
Matter			

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		
a	Objects are made of one or more materials.		Level 3 M4 L19–L28
b	Physical properties remain the same as the material is changed in visible size.		Level 5 M1 L1–L4
c	Visible physical changes are identified.		Level 5 M1 L1–L2 Level 5 M1 L5–L6
Life Processes			
3.4	The student will investigate and understand that adaptations allow animals to satisfy life needs and respond to the environment. Key concepts include		
a	Behavioral adaptations.		Level 3 M2 L1–L2 Level 3 M2 L9–L12 Level 3 M2 L16–21
b	Physical adaptations.		Level 3 M2 L6–L7 Level 3 M2 L9–L12
Living Systems			
3.5	The student will investigate and understand relationships among organisms in aquatic and terrestrial food chains. Key concepts include		
a	Producer, consumer, decomposer.		Level 5 M2 L1–L2 Level 5 M2 L6–L14 Level 5 M2 L24–L26
b	Herbivore, carnivore, omnivore.		Level 5 M2 L8–L14 Level 5 M2 L20 Level 5 M2 L24–L26
c	Predator and prey.		Level 3 M3 L21–L25
3.6	The student will investigate and understand that ecosystems support a diversity of plants and animals that share limited resources. Key concepts include		
a	Aquatic ecosystems.		Level 3 M3 L1–L3 Level 3 M3 L6
b	Terrestrial ecosystems.		Level 3 M1 L14 Level 3 M2 L8 Level 3 M2 L12 Level 3 M2 L14 Level 3 M2 L18–L22 Level 3 M3 L22–L23
c	Populations and communities.		Level 3 M2 L1–L3 Level 3 M2 L13–L19 Level 3 M3 L1–L3 Level 3 M3 L10–L11
d	The human role in conserving limited resources.		Level 3 M1 L21–L26 Level 3 M2 L11 Level 3 M2 L14
Interrelationships in Earth/Space Systems			
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		
a	Soil provides the support and nutrients necessary for plant growth.		Level 3 M2 L9–L10 Level 3 M3 L12–L13
b	Topsoil is a natural product of subsoil and bedrock.		
c	Rock, clay, silt, sand, and humus are components of soils.		Level 5 M3 L1–L13

			Level 5 M3 L18 Level 5 M3 L27
d	Soil is a natural resource and should be conserved.		Level 3 M1 L1–L29
Earth Patterns, Cycles, and Change			
3.8	The student will investigate and understand basic patterns and cycles occurring in nature. Key concepts include		
a	Patterns of natural events such as day and night, seasonal changes, simple phases of the moon, and tides.		Level 3 M1 L8–L12 Level 3 M2 L16–L21
b	Animal life cycles.		Level 3 M3 L7–L8 Level 3 M3 L23–L28
c	Plant life cycles.		Level 3 M3 L7–L8 Level 3 M3 L12–L15 Level 3 M3 L23–L28
3.9	The student will investigate and understand the water cycle and its relationship to life on Earth. Key concepts include		
a	There are many sources of water on Earth.		Level 3 M1 L1–L2 Level 3 M1 L17 Level 3 M1 L19 Level 3 M2 L1–L2 Level 3 M2 L5 Level 3 M2 L11
b	The energy from the sun drives the water cycle.		
c	The water cycle involves several processes.		Level 5 M3 L8
d	Water is essential for living things.		Level 5 M3 L1 Level 5 M3 L14 Level 5 M3 L17–L18
e	Water on Earth is limited and needs to be conserved.		Level 3 M3 L12–L13 Level 3 M3 L19
Earth Resources			
3.10	The student will investigate and understand that natural events and human influences can affect the survival of species. Key concepts include		
a	The interdependency of plants and animals.		Level 3 M2 L1–L28
b	The effects of human activity on the quality of air, water, and habitat.		Level 5 M3 L14–L27
c	The effects of fire, flood, disease, and erosion on organisms.		Level 3 M1 L1–L10
d	Conservation and resource renewal.		Level 5 M3 L17 Level 5 M3 L19–L23
3.11	The student will investigate and understand different sources of energy. Key concepts include		
a	Energy from the sun.		Level 5 M2 L6–L7 Level 5 M2 L16 Level 5 M2 L18–L19
b	Sources of renewable energy.		Level 4 M2 L1–L2 Level 4 M2 L13–L17
c	Sources of nonrenewable energy.		Level 4 M1 L21–L27

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Key: Module (M), Lesson (L)

PhD Science Level 4

The Grade 4 Virginia Science Standards of Learning are partially covered by the *PhD Science* curriculum. A detailed analysis of alignment is provided in the table below.

Grade 4 Standards			**Aligned *PhD Science* Lessons**
Scientific Investigation, Reasoning, and Logic			
4.1	The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which		
a	Distinctions are made among observations, conclusions, inferences, and predictions.		Level 4 M1 L1–L24 Level 4 M2 L1–L25 Level 4 M3 L1–L31 Level 4 M4 L1–L27
b	Objects or events are classified and arranged according to characteristics or properties.		Level 4 M1 L1–L24
c	Appropriate instruments are selected and used to measure length, mass, volume, and temperature in metric units.		Level 4 M1 L12–L17 Level 4 M1 L21–L27 Level 4 M2 L1–L3 Level 4 M2 L7–L23 Level 4 M3 L3–L21 Level 4 M3 L29–L31 Level 4 M4 L3–L4 Level 4 M4 L7–L9 Level 4 M4 L14–L17 Level 4 M4 L25–L27
d	Appropriate instruments are selected and used to measure elapsed time.		Level 4 M2 L7
e	Predictions and inferences are made, and conclusions are drawn based on data from a variety of sources.		Level 4 M1 L1–L5 Level 4 M1 L8–L10 Level 4 M1 L15 Level 4 M1 L18–L22 Level 4 M2 L1–L3 Level 4 M2 L6–L11 Level 4 M2 L13–L14 Level 4 M2 L18

			Level 4 M2 L20 Level 4 M2 L24–L26 Level 4 M3 L1–L3 Level 4 M3 L6–L7 Level 4 M3 L9–L10 Level 4 M3 L15–L19 Level 4 M3 L27 Level 4 M4 L1–L6 Level 4 M4 L10–L13 Level 4 M4 L21 Level 4 M4 L25–L27
f	Independent and dependent variables are identified.		Level 4 M1 L10 Level 4 M2 L7 Level 4 M2 L15–L16 Level 4 M3 L15 Level 4 M3 L27 Level 4 M4 L3–L8 Level 4 M4 L10–L21
g	Constants in an experimental situation are identified.		Level 4 M1 L7 Level 4 M2 L7 Level 4 M3 L15
h	Hypotheses are developed as cause and effect relationships.		Level 4 M1 L1–L2 Level 4 M1 L6–L17 Level 4 M1 L19–L27 Level 4 M2 L1–L8 Level 4 M2 L10–L14 Level 4 M2 L24–L26 Level 4 M3 L1–L3 Level 4 M3 L6–L14 Level 4 M3 L20 Level 4 M3 L27 Level 4 M4 L5–L6 Level 4 M4 L9–L13 Level 4 M4 L18–L27
i	Data are collected, recorded, analyzed, and displayed using bar and basic line graphs.		Level 4 M2 L8 Level 4 M3 L17
j	Numerical data that are contradictory or unusual in experimental results are recognized.		Level 4 M1 L12–L17 Level 4 M1 L21–L27 Level 4 M2 L1–L3 Level 4 M2 L7–L23 Level 4 M3 L3–L21 Level 4 M3 L29–L31
k	Data are communicated with simple graphs, pictures, written statements, and numbers.		Level 4 M1 L3–L5 Level 4 M1 L12–L17 Level 4 M1 L23–L24 Level 4 M2 L8–L9 Level 4 M3 L17 Level 4 M4 L10–L21
l	Models are constructed to clarify explanations, demonstrate relationships, and solve needs.		Level 4 M1 L12–L17 Level 4 M1 L21–L27

			Level 4 M2 L1–L3 Level 4 M2 L7–L23 Level 4 M3 L3–L21 Level 4 M3 L29–L31 Level 4 M4 L3–L13 Level 4 M4 L18–L24
m	Current applications are used to reinforce science concepts.		Level 4 M1 L1–L24 Level 4 M2 L1–L25 Level 4 M3 L1–L31 Level 4 M4 L1–L27
Force, Motion, and Energy			
4.2	The student will investigate and understand characteristics and interactions of moving objects. Key concepts include		
a	Motion is described by an object's direction and speed.		Level 3 M4 L4–L16 Level 4 M2 L6–L7
b	Changes in motion are related to force and mass.		Level 3 M4 L7–L18 Level 4 M2 L6–L7
c	Friction is a force that opposes motion.		Level 3 M4 L16
d	Moving objects have kinetic energy.		Level 4 M2 L6 Level 4 M2 L9
4.3	The student will investigate and understand the characteristics of electricity. Key concepts include		
a	Conductors and insulators.		Level 4 M2 L12
b	Basic circuits.		Level 4 M2 L1–L7 Level 4 M2 L10–11
c	Static electricity.		
d	The ability of electrical energy to be transformed into light and motion, and to produce heat.		Level 4 M2 L10
e	Simple electromagnets and magnetism.		Level 3 M4 L19–L28 Level 4 M2 L12–L14 Level 4 M2 L19–L20
f	Historical contributions in understanding electricity.		Level 4 M4 L18–L24
Life Processes			
4.4	The student will investigate and understand basic plant anatomy and life processes. Key concepts include		
a	The structures of typical plants and the function of each structure.		Level 4 M3 L26–L31
b	Processes and structures involved with plant reproduction.		Level 4 M3 L26–L31
c	Photosynthesis.		Level 5 M2 L6
d	Adaptations allow plants to satisfy life needs and respond to the environment.		Level 4 M3 L26–L31
Living Systems			
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		
a	Plant and animal adaptations.		Level 4 M3 L1–L6 Level 4 M3 L11 Level 4 M3 L14 Level 4 M3 L18–L25 Level 4 M3 L29–L31

b	Organization of populations, communities, and ecosystems and how they interrelate.		Level 3 M2 L13–L28 Level 5 M2 L1–L2 Level 5 M2 L6–L20 Level 5 M2 L24–L26
c	Flow of energy through food webs.		Level 5 M2 L1–L2 Level 5 M2 L8–L14 Level 5 M2 L20 Level 5 M2 L24–L26
d	Habitats and niches.		Level 3 M2 L1–L2 Level 3 M2 L9–L12
e	Changes in an organism's niche at various stages in its life cycle.		Level 3 M3 L7–L8
f	Influences of human activity on ecosystems.		Level 3 M2 L16–L28 Level 5 M3 L14–L27
Interrelationships in Earth/Space Systems			
4.6	The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include		
a	Weather phenomena.		Level 3 M1 L4–L29 Level 4 M1 L6–L11 Level 4 M1 L18–L20 Level 4 M1 L24–L27
b	Weather measurements and meteorological tools.		Level 3 M1 L4–L15 Level 4 M1 L8–L11
c	Use of weather measurements and weather phenomena to make weather predictions.		Level 3 M1 L1–L29
Earth Patterns, Cycles, and Change			
4.7	The student will investigate and understand the organization of the solar system. Key concepts include		
a	The planets in the solar system.		
b	The order of the planets in the solar system.		
c	The relative sizes of the planets.		
4.8	The student will investigate and understand the relationships among Earth, the moon, and the sun. Key concepts include		
a	The motions of Earth, the moon, and the sun.		Level 5 M4 L1–L2 Level 5 M4 L5–L17 Level 5 M4 L20–L26
b	The causes for Earth's seasons.		Level 5 M4 L1–L2 Level 5 M4 L5–L17 Level 5 M4 L20–L26
c	The causes for the phases of the moon.		Level 5 M4 L13–L17 Level 5 M4 L24–L26
d	The relative size, position, age, and makeup of Earth, the moon, and the sun.		Level 4 M1 L1–L5 Level 4 M1 L19–L20 Level 4 M1 L25–L27
e	Historical contributions in understanding the Earth-moon-sun system.		Level 5 M4 L1–L17
Earth Resources			
4.9	The student will investigate and understand important Virginia natural resources. Key concepts include		
a	Watersheds and water resources.		Level 4 M1 L23–L24
b	Animals and plants.		Level 3 M2 L1–L19

			Level 3 M3 L1–L3 Level 4 M1 L21
c	Minerals, rocks, ores, and energy sources.		Level 4 M1 L1–L2 Level 4 M2 L1–L25
d	Forests, soil, and land.		Level 4 M1 L1–L27

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PhD Science Level 5

The Grade 5 Virginia Science Standards of Learning are partially covered by the *PhD Science* curriculum. A detailed analysis of alignment is provided in the table below.

Grade 5 Standards			**Aligned *PhD Science* Lessons**
Scientific Investigation, Reasoning, and Logic			
5.1	The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which		
a	Items such as rocks, minerals, and organisms are identified using various classification keys.		Level 5 M1 L3–L4
b	Estimates are made and accurate measurements of length, mass, volume, and temperature are made in metric units using proper tools.		Level 5 M1 L1–L6
c	Estimates are made and accurate measurements of elapsed time are made using proper tools.		Level 5 M1 L1–L2
d	Hypotheses are formed from testable questions.		Level 5 M1 L1–L2 Level 5 M1 L5–L6 Level 5 M1 L18–L22 Level 5 M3 L19–L23
e	Independent and dependent variables are identified.		Level 5 M1 L5–L6 Level 5 M1 L18–L22 Level 5 M2 L1–L8 Level 5 M2 L12 Level 5 M2 L15 Level 5 M2 L18 Level 5 M3 L11–L12 Level 5 M3 L15
f	Constants in an experimental situation are identified.		Level 5 M1 L5–L6 Level 5 M1 L18–L22 Level 5 M2 L1–L8 Level 5 M3 L11–L12 Level 5 M3 L15

g	Data are collected, recorded, analyzed, and communicated using proper graphical representations and metric measurements.		Level 5 M1 L15–L17 Level 5 M2 L3–L5 Level 5 M2 L8–L13 Level 5 M2 L15–L17 Level 5 M3 L4–L5 Level 5 M3 L14–L16 Level 5 M4 L14–L15
h	Predictions are made using patterns from data collected, and simple graphical data are generated.		Level 5 M1 L1–L2 Level 5 M2 L1–L2 Level 5 M2 L21–L23 Level 5 M3 L1–L3 Level 5 M3 L19–L23 Level 5 M4 L1–L2 Level 5 M4 L13
i	Inferences are made and conclusions are drawn.		Level 5 M1 L1–L2 Level 5 M1 L5–L6 Level 5 M1 L14 Level 5 M1 L18 Level 5 M3 L13 Level 5 M3 L20
j	Models are constructed to clarify explanations, demonstrate relationships, and solve needs.		Level 5 M1 L1–L10 Level 5 M1 L13–L14 Level 5 M1 L23–L26 Level 5 M2 L1–L2 Level 5 M2 L6–L7 Level 5 M2 L14 Level 5 M2 L20 Level 5 M3 L1–L3 Level 5 M3 L6–L16 Level 5 M3 L19–L27 Level 5 M4 L1–L4 Level 5 M4 L7–L17 Level 5 M4 L20–L26
k	Current applications are used to reinforce science concepts.		Level 5 M1 L1–L26 Level 5 M2 L1–L26 Level 5 M3 L1–L27 Level 5 M4 L1–L26
Force, Motion, and Energy			
5.2	The student will investigate and understand how sound is created and transmitted, and how it is used. Key concepts include		
a	Compression waves.		
b	Vibration, compression, wavelength, frequency, amplitude.		Level 4 M3 L7–L14 Level 4 M3 L29–L31
c	The ability of different media (solids, liquids, and gases) to transmit sound.		Level 4 M2 L4–L5 Level 4 M2 L9–L11 Level 4 M2 L24–L26 Level 4 M3 L12–L14
d	Uses and applications of sound waves.		Level 4 M3 L7 Level 4 M3 L10 Level 4 M3 L12–L14

5.3	The student will investigate and understand basic characteristics of visible light and how it behaves. Key concepts include		
a	Transverse waves.		
b	The visible spectrum.		
c	Opaque, transparent, and translucent.		Level 5 M1 L9–L10 Level 5 M4 L3
d	Reflection of light from reflective surfaces.		Level 4 M4 L1–L17 Level 4 M4 L25–L27
e	Refraction of light through water and prisms.		
Matter			
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		
a	Distinguishing properties of each phase of matter.		Level 5 M1 L1–L12
b	The effect of temperature on the phases of matter.		Level 5 M1 L9–L12
c	Atoms and elements.		
d	Molecules and compounds.		
e	Mixtures including solutions.		Level 5 M1 L1–L2 Level 5 M1 L13–L15 Level 5 M1 L20
Living Systems			
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		
a	Basic cell structures and functions.		
b	Classification of organisms using physical characteristics, body structures, and behavior of the organism.		Level 3 M3 L1–L3 Level 4 M3 L1–L6 Level 4 M3 L11 Level 4 M3 L14 Level 4 M3 L18–L25 Level 4 M3 L29–L31
c	Traits of organisms that allow them to survive in their environment.		Level 3 M2 L1–L2 Level 3 M2 L9–L28 Level 3 M3 L9–L13 Level 4 M3 L1–L3 Level 5 M1 L1–L2 Level 5 M2 L8–L14 Level 5 M2 L20 Level 5 M2 L24–L26
Interrelationships in Earth/Space Systems			
5.6	The student will investigate and understand characteristics of the ocean environment. Key concepts include		
a	Geological characteristics.		Level 5 M3 L4–L6 Level 5 M3 L11–L13 Level 5 M3 L19 Level 5 M3 L20 Level 5 M3 L24–L27
b	Physical characteristics.		Level 5 M1 L3–L4 Level 5 M1 L13–L14 Level 5 M1 L17

			Level 5 M3 L4–L6 Level 5 M3 L11–L13 Level 5 M3 L19–L20 Level 5 M3 L24–L27
c	Ecological characteristics.		Level 5 M3 L4–L6 Level 5 M3 L11–L13 Level 5 M3 L19–L20 Level 5 M3 L24–L27
Earth Patterns, Cycles, and Change			
5.7	The student will investigate and understand how Earth's surface is constantly changing. Key concepts include		
a	Identification of rock types		Level 4 M1 L1–L5
b	The rock cycle and how transformations between rocks occur.		Level 5 M2 L12 Level 5 M2 L26 Level 5 M3 L8 Level 5 M3 L10–L12 Level 5 M3 L18
c	Earth history and fossil evidence.		Level 3 M2 L1–L8 Level 3 M2 L26–L28 Level 4 M1 L1–L5 Level 4 M1 L19–L20 Level 4 M1 L25–L27
d	The basic structure of Earth's interior.		
e	Changes in Earth's crust due to plate tectonics.		
f	Weathering, erosion, and deposition.		Level 4 M1 L6–L11 Level 4 M1 L25–L27 Level 5 M2 L12 Level 5 M3 L12–L13
g	Human impact.		Level 5 M3 L14–L27