PhD Science® K–5 Curriculum Correlation to Tennessee Academic Standards for Science

Contents

K–2 Grade Band

3–5 Grade Band

PhD Science® Correlation to Tennessee Academic Standards for Science: Level K

The *PhD Science* K–5 curriculum aligns with the Kindergarten Tennessee Academic Standards for Science. A detailed analysis of alignment appears in the table below.

Key: Module (M), Lesson (L)

Kindergarten Disciplinary Core Ideas and Component Ideas

Physical Sciences (PS)

K.PS1: Matter and Its Interactions

A. Structure and Properties of Matter		**Aligned *PhD Science* Lessons**
K.PS1.1	Plan and conduct an investigation using patterns to classify different kinds of materials by their observable properties (i.e., absorbency, color, texture, hardness, and flexibility), by their uses, and by whether they occur naturally or are manufactured.	Level K M1 L6–7, 12–16 Level 2 M1 L1–9, 12–16, 19, 23, 29–31 Level 2 M2 L3–4, 14–17
K.PS1.2	Conduct investigations to understand that matter can exist in different states (i.e., solid and liquid) and has properties that can be observed and tested.	Level 2 M1 L1–16, 19, 23, 29–31 Level 2 M2 L3–4, 14–17
K.PS1.3	Construct an evidence-based account of how an object made of a small set of pieces (e.g., blocks, snap cubes) can be disassembled and made into a new object.	Level 2 M1 L10–11, 29–31

K.PS4: Waves and Their Applications in Technologies for Information Transfer

C. Information Technologies and Instrumentation		**Aligned *PhD Science* Lessons**
K.PS4.1	Record data from an investigation using senses to detect light, sound, and vibrations and communicate observations.	Level 1 M2 L15–18 Level 1 M3 L4–29

Life Sciences (LS)

K.LS1: From Molecules to Organisms: Structures and Processes

C. Organization for Matter and Energy Flow in Organisms		**Aligned *PhD Science* Lessons**
K.LS1.1	Use information from observations to identify the differences between plants and animals and how they live and grow.	Level K M3 L1–3, 9–29 Level K M4 L1–2, 8–9, 11–13
K.LS1.2	Recognize differences between living organisms and non-living materials and sort them into groups by observable physical attributes.	Level K M3 L3, 12, 20, 24 (Implicit) Level K M4 L2, 5, 7, 9, 13, 16 (Implicit) Level 2 M4 L1–6, 11–13
D. Information Processing		**Aligned *PhD Science* Lessons**
K.LS1.3	Explain how animals, including humans, use their five senses to interact with the environment.	Level 1 M1 L16–18 Level 2 M1 L4–7, 17–18

K.LS3.1: Heredity: Inheritance and Variation of Traits

A. Inheritance of Traits		**Aligned *PhD Science* Lessons**
K.LS3.1	Collect and analyze observational data to show that young living things are like, but not exactly like, their parents.	Level 1 M1 L22–23, 26–29

Earth Sciences (ES)

K.ESS2: Earth's Systems

D. Weather and Climate		**Aligned *PhD Science* Lessons**
K.ESS2.1	Make observations to gather weather data (i.e., precipitation, wind, temperature, cloud cover) using tools (e.g., thermometer, rain gauge).	Level K M1 L1–11, 17–24, 28–30 Level K M4 L25
K.ESS2.2	Use simple graphs and pictorial weather symbols to describe weather patterns that occur over time (i.e., hourly, daily).	Level K M1 L4–27
K.ESS2.3	Develop and use models to predict weather and identify patterns in spring, summer, autumn, and winter.	Level K M1 L1–11, 17–24, 28–30 Level K M4 L25

K.ESS3: Earth and Human Activity

A. Natural Resources		**Aligned *PhD Science* Lessons**
K.ESS3.1	Use a model to represent the way the environment meets the basic needs (shelter, food, water) of living things (including humans) and the places they live.	Level K M3 L1–3, 9–29 Level K M4 L1–5, 8–9, 11–13
B. Natural Hazards		**Aligned *PhD Science* Lessons**
K.ESS3.2	Explain the purpose of weather forecasting to prepare for, and respond to, severe weather in Tennessee.	Level K M1 L22–30 *PhD Science* K–5 curriculum does not explicitly refer to Tennessee.
C. Human Impacts on Earth Systems		**Aligned *PhD Science* Lessons**
K.ESS3.3	Communicate solutions that will reduce the impact from humans on land, water, air, and other living things in the local environment.	Level K M4 L14–24, 26–28

Engineering, Technology, and Applications of Science (ETS)

K.ETS1: Engineering Design

A. Defining and Delimiting Engineering Problems		**Aligned *PhD Science* Lessons**
K.ETS1.1	Apply an engineering design approach to identify and solve practical problems.	Level K M1 L12–16 Level K M2 L17–20 Level K M4 L20–24
K.ETS1.3	Ask and answer questions about the scientific world and gather information using the senses.	Level K M1 L12–16
B. Developing Possible Solutions		**Aligned *PhD Science* Lessons**
K.ETS1.2	Use drawings and labels to communicate ideas and designs accurately.	Level K M1 L12–16 Level K M2 L17–20 Level K M4 L20–24

K.ETS2: Links Among Engineering, Technology, Science, and Society

A. Interdependence of Science, Technology, Engineering, and Math (STEM)		**Aligned *PhD Science* Lessons**
K.ETS2.1	Use appropriate tools (e.g., magnifying glass, rain gauge, basic balance scale) to make observations and answer testable scientific questions.	Level K M2 L17–20

Science and Engineering Practices

Asking Questions and Defining Problems	Aligned *PhD Science* Lessons
	Level K M1 L1–9, 12–16, 22–26 Level K M2 L1–3, 9 Level K M3 L1–8, 14–16, 22, 27–29

Developing and Using Models	Aligned *PhD Science* Lessons
	Level K M1 L1–2, 12–16 Level K M2 L1–3, 10–12 Level K M3 L1–3, 9–12, 19–20 Level K M4 L1–9, 11–16

Planning and Carrying Out Investigations	Aligned *PhD Science* Lessons
	Level K M1 L4–7, 10–24, 27–30 Level K M2 L7–8, 10–23 Level K M3 L4–8, 21 Level K M4 L3–5

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
	Level K M1 L4–7, 22–24 Level K M2 L4–8, 21–23 Level K M3 L1–20, 22–26 Level K M4 L1–2, 6–7, 10, 14–17, 20–28

Using Mathematics and Computational Thinking	Aligned *PhD Science* Lessons
	Level K M1 L17–21, 25–30 Level K M2 L17–20

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
	Level K M2 L17–20 Level K M3 L4–16, 23–29

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
	Level K M3 L17–21, 27–29 Level K M4 L3–5, 11–13, 17, 25, 27–28

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
	Level K M1 L12–16, 25–26, 28–30 Level K M2 L21–23 Level K M3 L23–29 Level K M4 L1–2, 6–10, 14–16, 18–24, 26–28

Crosscutting Concepts

Patterns	Aligned *PhD Science* Lessons
	Level K M1 L17–30 Level K M2 L1–6, 17–20 Level K M3 L4–8, 14–20, 22, 26–29 Level K M4 L3–5

Cause and Effect	Aligned *PhD Science* Lessons
	Level K M2 L4–23 Level K M3 L28–29 Level K M4 L3–5, 10, 14–19, 26–28

Scale, Proportion, and Quantity	Aligned *PhD Science* Lessons
	Level K M1 L1–7, 10–24, 28–30 Level K M2 L7–9, 13–15, 21–23 Level K M3 L1–3 Level K M4 L25

Systems and System Models	Aligned *PhD Science* Lessons
	Level K M3 L1–3, 9–13, 19–21, 23–25, 27–29 Level K M4 L1–9, 11–16

Energy and Matter	Aligned *PhD Science* Lessons
	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24

Structure and Function	Aligned *PhD Science* Lessons
	Level K M1 L10–16 Level K M4 L20–24

Stability and Change	Aligned *PhD Science* Lessons
	Level K M1 L8–9, 17–21 Level K M4 L14–16

PhD Science® Correlation to Tennessee Academic Standards for Science: Level 1

The *PhD Science* K–5 curriculum aligns with the First Grade Tennessee Academic Standards for Science. A detailed analysis of alignment appears in the table below.

Key: Module (M), Lesson (L)

First Grade Disciplinary Core Ideas and Component Ideas

Physical Sciences (PS)

1.PS3: Energy

B. Conservation of Energy and Energy Transfer		**Aligned *PhD Science* Lessons**
1.PS3.1	Make observations to determine how sunlight warms Earth's surfaces (i.e., sand, soil, rocks, and water).	Level K M1 L8–11, 28–30

1.PS4: Waves and Their Applications in Technologies for Information Transfer

B. Electromagnetic Radiation		**Aligned *PhD Science* Lessons**
1.PS4.1	Make observations to construct an evidence-based account that objects are visible when light shines on them or if they produce their own light (e.g., very hot objects), and that different amounts of light influence what we can see.	Level 1 M2 L1–9, 21–23
1.PS4.2	Conduct an investigation to describe how the path of a beam of light can be changed by interactions with different materials (i.e., light passes through, some light passes through, light changes directions, or light is blocked which can cause shadows).	Level 1 M2 L1–3, 10–23

Life Sciences (LS)

1.LS1: From Molecules to Organisms: Structures and Processes

A. Structure and Function		**Aligned *PhD Science* Lessons**
1.LS1.1	Develop and use a model to explain the structure of plants (i.e., roots, stems, leaves, flowers, fruits) and describe the function of the parts (taking in water and air, producing food, making new plants).	Level 1 M1 L1–15, 27–29
B. Growth and Development of Organisms		**Aligned *PhD Science* Lessons**
1.LS1.2	Observe and analyze how living organisms grow and change over time.	Level 1 M1 L7–10, 19–21 Level 2 M3 L1–7
D. Information Processing		**Aligned *PhD Science* Lessons**
1.LS1.3	Analyze and interpret data from observations to describe how plants respond to changes in the environment (e.g., turn leaves toward the sun).	Level 1 M1 L19–21

1.LS2: Ecosystems: Interactions, Energy, and Dynamics

A. Interdependent Relationships in Ecosystems		**Aligned *PhD Science* Lessons**
1.LS2.1	Conduct an experiment to show how plants depend on air, water, minerals from soil, and light to grow and thrive.	Level K M3 L4–8 Level 1 M1 L19–21 Level 2 M3 L1–7, 25–29
1.LS2.2	Obtain and communicate information to classify plants by where they grow (i.e., water, land) and the plant's physical characteristics.	Level K M3 L9–13 Level 2 M4 L1–3, 7–25
B. Cycles of Matter and Energy Transfer in Ecosystems		**Aligned *PhD Science* Lessons**
1.LS2.3	Develop and use models to show how plants and animals depend on their surroundings and other living things to meet their needs in the places they live.	Level K M3 L1–3, 9–29 Level K M4 L1–2, 8–9, 11–13

Earth and Space Sciences (ESS)

1.ESS1: Earth's Place in the Universe

A. The Universe and Its Stars		**Aligned *PhD Science* Lessons**
1.ESS1.1	Use observations or models of the sun, moon, and stars to describe patterns that can be predicted.	Level 1 M4 L1–8, 14–25
1.ESS1.2	Observe natural objects in the sky that can be seen from Earth with the naked eye, and recognize that a telescope, used as a tool, can provide greater detail of objects in the sky.	Level 1 M4 L14–16
B. Earth and the Solar System		**Aligned *PhD Science* Lessons**
1.ESS1.3	Make observations to predict patterns between sunrise and sunset, and the change of seasons.	Level 1 M4 L9–13, 23–25

Engineering, Technology, and Applications of Science (ETS)

1.ETS1: Engineering Design

A. Defining and Delimiting Engineering Problems		**Aligned *PhD Science* Lessons**
1.ETS1.1	Apply an engineering design approach to identify and solve practical problems.	Level 1 M1 L11–15 Level 1 M3 L20–25
1.ETS1.2	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved.	Level 1 M2 L1–3, 10–23
B. Developing Possible Solutions		**Aligned *PhD Science* Lessons**
1.ETS1.3	Develop a simple sketch, drawing, or physical model that communicates solutions to others.	Level 1 M3 L21–25

Science and Engineering Practices

Asking Questions and Defining Problems	Aligned *PhD Science* Lessons
	Level 1 M1 L1–3, 11–15 Level 1 M2 L1–3 Level 1 M3 L1–3 Level 1 M4 L1–3, 14–16

Developing and Using Models	Aligned *PhD Science* Lessons
	Level 1 M1 L1–9, 11–15, 18, 28–29 Level 1 M2 L1–7, 10–23 Level 1 M3 L7, 11–14 Level 1 M4 L1–3, 7–8

Planning and Carrying Out Investigations	Aligned *PhD Science* Lessons
	Level 1 M1 L19–20 Level 1 M2 L4–12, 15–18, 22–23 Level 1 M3 L1–9, 11–13, 15–29 Level 1 M4 L1–6, 14–16, 19–21

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
	Level 1 M1 L10, 16–21, 27–29 Level 1 M2 L1–9 Level 1 M3 L8–13, 15–16, 26–29 Level 1 M4 L4–6, 9–13

Using Mathematics and Computational Thinking	Aligned *PhD Science* Lessons
	Level 1 M2 L15–18 Level 1 M3 L21–25

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
	Level 1 M1 L7–8, 11–17, 22–23, 26–29 Level 1 M2 L4–7, 21–23 Level 1 M3 L4–6, 14, 21–29

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
	Level 1 M3 L4–6, 8–9, 18–20 Level 1 M4 L4–25

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
	Level 1 M1 L24–25, 27–29 Level 1 M2 L21–23 Level 1 M3 L18–19, 26–29 Level 1 M4 L9–18, 23–25

Crosscutting Concepts

Patterns	Aligned *PhD Science* Lessons
	Level 1 M1 L1–6, 16–29 Level 1 M2 L1–9, 21–23 Level 1 M3 L1–7, 11–13, 17–20, 26–29 Level 1 M4 L1–25

Cause and Effect	Aligned *PhD Science* Lessons
	Level 1 M2 L1–7, 10–23 Level 1 M3 L4–7, 14–17, 26–29 Level 1 M4 L4–6, 9–13, 17–21, 23–25

Scale, Proportion, and Quantity	Aligned *PhD Science* Lessons
	Level K M1 L1–7, 10–24, 28–30 Level K M2 L7–9, 13–15, 21–23 Level K M3 L1–3 Level K M4 L25 Level 2 M1 L8–9 Level 2 M2 L18–21 Level 2 M3 L3–6, 14–18, 25–29 Level 2 M4 L1–6, 17–19, 22–25

Systems and System Models	Aligned *PhD Science* Lessons
	Level 1 M1 L1–8, 16–17 Level 1 M2 L1–3, 10–23 Level 1 M3 L1–3, 8–10, 14, 21–29

Energy and Matter	Aligned *PhD Science* Lessons
	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24

Structure and Function	Aligned *PhD Science* Lessons
	Level 1 M1 L4–15, 27–29 Level 1 M3 L8–9

Stability and Change	Aligned *PhD Science* Lessons
	Level K M1 L8–9, 17–21 Level K M4 L14–16 Level 2 M2 L1–2, 18–24 Level 2 M3 L1–2, 25–29

PhD Science® Correlation to Tennessee Academic Standards for Science: Level 2

The *PhD Science* K–5 curriculum aligns with the Second Grade Tennessee Academic Standards for Science. A detailed analysis of alignment appears in the table below.

Key: Module (M), Lesson (L)

Second Grade Disciplinary Core Ideas and Component Ideas

Physical Sciences (PS)

2.PS2: Motion and Stability: Forces and Interactions

A. Forces, Fields, and Motion		**Aligned *PhD Science* Lessons**
2.PS2.1	Analyze the push or the pull that occurs when objects collide or are connected.	Level K M2 L13–23
C. Stability and Instability in Physical Systems		**Aligned *PhD Science* Lessons**
2.PS2.2	Plan and carry out an investigation to demonstrate how pushing and/or pulling an object affects the motion of the object within a system.	Level K M2 L1–23

2.PS3: Energy

C. Relationship Between Energy, Forces, and Fields		**Aligned *PhD Science* Lessons**
2.PS3.1	Demonstrate how a stronger push or pull makes things go faster and how faster speeds during a collision can cause a bigger change in the shape of the colliding objects.	Level K M2 L1–23
D. Energy in Chemical Processes and Everyday Life		**Aligned *PhD Science* Lessons**
2.PS3.2	Make observations and conduct experiments to provide evidence that friction produces heat and reduces or increases the motion of an object.	Level 3 M1 L15–18

2.PS4: Waves and Their Applications in Technologies for Information Transfer

A. Wave Properties: Mechanical and Electromagnetic		**Aligned *PhD Science* Lessons**
2.PS4.1	Plan and conduct investigations to demonstrate the cause and effect relationship between vibrating materials and sound.	Level 1 M3 L1–17, 26–29
C. Information Technologies and Instrumentation		**Aligned *PhD Science* Lessons**
2.PS4.2	Use tools and materials to design and build a device to understand that light and sound travel in waves and can send signals over a distance.	Level 1 M3 L18–29
2.PS4.3	Obtain information to describe how devices communicate over a distance using light or sound.	Level 1 M3 L18–29

Life Sciences (LS)

2.LS1: From Molecules to Organisms: Structures and Processes

A. Structure and Function		**Aligned *PhD Science* Lessons**
2.LS1.1	Use evidence and observations to explain that many animals use their body parts and senses in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air.	Level 1 M1 L1–15, 27–29
2.LS1.2	Obtain and communicate information to classify animals (i.e., vertebrates: mammals, birds, amphibians, reptiles, fish; and invertebrates: insects) based on their physical characteristics.	Level 1 M1 L4–6, 22–23, 27–29
B. Growth and Development of Organisms		**Aligned *PhD Science* Lessons**
2.LS1.3	Identify ways in which some animals, both parents and offspring, participate in behaviors that help the offspring survive.	Level 1 M1 L24–29

2.LS2: Ecosystems: Interactions, Energy, and Dynamics

A. Interdependent Relationships in Ecosystems		**Aligned *PhD Science* Lessons**
2.LS2.1	Develop and use models to compare how animals depend on their surroundings and other living things to meet their needs in the places they live.	Level 2 M4 L1–3, 7–25
C. Ecosystem Dynamics, Functioning, and Resilience		**Aligned *PhD Science* Lessons**
2.LS2.2	Predict what happens to animals when the environment changes (temperature, cutting down trees, wildfires, pollution, salinity, drought, land preservation).	Level K M4 L1–5, 11–19

Earth and Space Sciences (ESS)

2.ESS1: Earth's Place in the Universe

C. The History of Planet Earth		**Aligned *PhD Science* Lessons**
2.ESS1.1	Recognize that some of Earth's natural processes are cyclical, while others have a beginning and an end. Some events happen quickly, while others occur slowly over time.	Level 2 M2 L18–24

2.ESS2: Earth's Systems

A. Earth Materials and Systems		**Aligned *PhD Science* Lessons**
2.ESS2.1	Compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	Level 2 M2 L1–17, 20, 22–24
B. Plate Tectonics and Large-Scale System Interactions		**Aligned *PhD Science* Lessons**
2.ESS2.3	Develop and compare simple maps of different land areas to observe the shapes and kinds of land (rock, soil, sand) and water (river, stream, lake, pond).	Level 2 M2 L1–2, 5–6 Level 2 M4 L1–6, 11–16, 20–21, 23–25
C. The Roles of Water in Earth's Surface Processes		**Aligned *PhD Science* Lessons**
2.ESS2.2	Observe and analyze how blowing wind and flowing water can move Earth materials (soil, rocks) from one place to another, changing the shape of a landform and affecting the habitats of living things.	Level 2 M2 L1–17, 20, 22–24
2.ESS2.4	Use information obtained from reliable resources to explain that water is found in oceans, rivers, streams, lakes, and ponds, and may be solid or liquid.	Level 2 M4 L1–6, 16, 22–25

Engineering, Technology, and Applications of Science (ETS)

2.ETS1: Engineering Design

A. Defining and Delimiting Engineering Problems		**Aligned *PhD Science* Lessons**
2.ETS1.1	Apply an engineering design approach to identify and solve practical problems.	Level 2 M1 L24–28 Level 2 M2 L8–12 Level 2 M3 L14–18
B. Developing Possible Solutions		**Aligned *PhD Science* Lessons**
2.ETS1.2	Recognize that to solve a problem, one may need to break the problem into parts, address each part, and then bring the parts back together.	Level 2 M1 L24–28
C. Optimizing the Design Solution		**Aligned *PhD Science* Lessons**
2.ETS1.3	Compare and contrast solutions to a design problem by using evidence to point out strengths and weaknesses of the design.	Level 2 M2 L8–12, 14–17

2.ETS2: Links Among Engineering, Technology, Science, and Society

A. Interdependence of Science, Technology, Engineering, and Math (STEM)		**Aligned *PhD Science* Lessons**
2.ETS2.1	Use appropriate tools to make observations, record data, and refine design ideas.	Level 2 M3 L3–6, 14–18
B. Influence of Engineering, Technology, and Science on Society and the Natural World		**Aligned *PhD Science* Lessons**
2.ETS2.2	Predict and explain how human life and the natural world would be different without current technologies.	Level 2 M2 L8–12

Science and Engineering Practices

Asking Questions and Defining Problems	Aligned *PhD Science* Lessons
	Level 2 M1 L1–3 Level 2 M2 L1–2 Level 2 M3 L1–6, 14–18 Level 2 M4 L1–3

Developing and Using Models	Aligned *PhD Science* Lessons
	Level 2 M1 L1–3, 14–16, 19, 29–31 Level 2 M2 L1–2, 14–17, 20–24 Level 2 M3 L1–6, 8–12, 14–20, 23–29 Level 2 M4 L1–8, 20–21, 23–25

Planning and Carrying Out Investigations	Aligned *PhD Science* Lessons
	Level 2 M1 L1–3, 17–18, 20–22, 24–31 Level 2 M2 L1–6, 8–12, 14–19, 22–24 Level 2 M3 L3–11, 13, 21–22, 25–29 Level 2 M4 L16–19

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
	Level 2 M1 L4–11, 14–18, 20–22, 24–28 Level 2 M2 L5–6, 8–9 Level 2 M3 L14–20 Level 2 M4 L22–25

Using Mathematics and Computational Thinking	Aligned *PhD Science* Lessons
	Level 2 M1 L20–22 Level 2 M2 L14–17 Level 2 M3 L8–11, 23–29 Level 2 M4 L7–8, 17–22

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
	Level 2 M1 L8–9, 12–13, 17–19, 23–31 Level 2 M2 L3–4, 7–17, 22–24 Level 2 M4 L23–25

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
	Level 2 M2 L3–4, 10–13, 20–24 Level 2 M3 L14–18, 21–22 Level 2 M4 L4–6, 9–13, 16, 20–21, 23–25

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
	Level 2 M1 L29–31 Level 2 M2 L1–2, 5–6, 14–19, 22–24 Level 2 M3 L8–12, 14–20, 25–29 Level 2 M4 L4–9, 11–16, 23–25

Crosscutting Concepts

Patterns	**Aligned *PhD Science* Lessons**
	Level 2 M1 L4–9 Level 2 M2 L1–2, 5–6 Level 2 M4 L1–8, 11–15, 20–21, 23–25

Cause and Effect	**Aligned *PhD Science* Lessons**
	Level 2 M1 L14–19, 29–31 Level 2 M2 L8–12, 20–21 Level 2 M3 L3–11

Scale, Proportion, and Quantity	**Aligned *PhD Science* Lessons**
	Level 2 M1 L8–9 Level 2 M2 L18–21 Level 2 M3 L3–6, 14–18, 25–29 Level 2 M4 L1–6, 17–19, 22–25

Systems and System Models	**Aligned *PhD Science* Lessons**
	Level 2 M1 L1–7, 12–13, 20–23, 29–31 Level 2 M2 L3–4, 7–12, 14–17 Level 2 M3 L8–13, 19–24 Level 2 M4 L7–16, 23–25

Energy and Matter	Aligned *PhD Science* Lessons
	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24

Structure and Function	Aligned *PhD Science* Lessons
	Level 2 M1 L24–28 Level 2 M2 L14–17 Level 2 M3 L8–11, 14–22

Stability and Change	Aligned *PhD Science* Lessons
	Level 2 M2 L1–2, 18–24 Level 2 M3 L1–2, 25–29

PhD Science® Correlation to Tennessee Academic Standards for Science: Level 3

The *PhD Science* K–5 curriculum aligns with the Third Grade Tennessee Academic Standards for Science. A detailed analysis of alignment appears in the table below.

Key: Module (M), Lesson (L)

Third Grade Disciplinary Core Ideas and Component Ideas

Physical Sciences (PS)

3.PS1: Matter and Its Interactions

A. Structure and Properties of Matter		**Aligned *PhD Science* Lessons**
3.PS1.1	Develop a model of solids, liquids, and gasses to describe that each state of matter is made up of particles too small to be seen.	Level 5 M1 L5–10, 23–26
3.PS1.3	Construct an argument based on evidence that materials have both fixed and changing properties, some of which are useful for identification of a material.	Level 2 M1 L1–4, 17–19, 23
B. Chemical Processes		**Aligned *PhD Science* Lessons**
3.PS1.2	Construct an explanation about the effects of heating and cooling a substance differentiating between changes that can be reversed (i.e., freezing and melting) and those that cannot (e.g., baking a cake or burning fuel).	Level 2 M1 L14–19, 29–31

3.PS2: Motion and Stability: Forces and Interactions

B. Types of Interactions		**Aligned *PhD Science* Lessons**
3.PS2.1	Explain the cause and effect relationships of forces that cannot be seen including interactions between two objects not in contact with each other (i.e., static electricity, magnetism, and gravity).	Level 3 M4 L19–30

3.PS3: Energy

B. Conservation of Energy and Energy Transfer		**Aligned *PhD Science* Lessons**
3.PS3.1	Make observations of sound, light, heat, and motion to collect evidence that energy is present in a system.	Level 4 M2 L1–5, 10–11, 24–26
3.PS3.2	Develop a model to show that energy can be transferred from place to place by electric currents in a system (e.g., open, closed, simple, parallel, series circuits).	Level 4 M2 L1–3, 10–26
C. Relationship Between Energy and Forces and Fields		**Aligned *PhD Science* Lessons**
3.PS3.3	Evaluate how magnets cause changes in the motion and position of objects, even when the objects are not touching the magnet.	Level 3 M4 L19–21, 28–30

Life Sciences (LS)

3.LS1: From Molecules to Organisms: Structures and Processes

A. Structure and Function		**Aligned *PhD Science* Lessons**
3.LS1.2	Analyze the internal and external structures that aquatic and land animals and plants have to support survival, growth, behavior, and reproduction.	Level 3 M3 L7–8, 21–28
B. Growth and Development of Organisms		**Aligned *PhD Science* Lessons**
3.LS1.1	Use graphical representations to compare how species including humans and other organisms have unique and diverse life cycles.	Level 3 M3 L7–8, 23–28

3.LS2: Ecosystems: Interactions, Energy, and Dynamics

D. Social Interactions and Group Behavior		**Aligned *PhD Science* Lessons**
3.LS2.1	Obtain information to compare various ways that groups organize (e.g., specialized roles for members vs. same roles for members) to explain the benefits of animal group behavior.	Level 3 M2 L13–15, 26–28

3.LS4: Biological Change: Unity and Diversity

C. Adaptation		**Aligned *PhD Science* Lessons**
3.LS4.1	Use evidence to explain the cause and effect relationship between a naturally changing habitat and how well an organism survives.	Level 3 M2 L1–2, 9–12, 16–19, 22–28
D. Biodiversity and Humans		**Aligned *PhD Science* Lessons**
3.LS4.2	Use evidence to determine the changes between an environment's biodiversity and human resources.	Level 3 M2 L16–28

Earth and Space Sciences (ESS)

3.ESS1: Earth's Place in the Universe

B. Earth and the Solar System		**Aligned *PhD Science* Lessons**
3.ESS1.1	Use data to categorize different bodies in our solar system, including inner and outer planets, moons, asteroids, comets, and meteoroids according to their physical properties and motion.	Level 5 M4 L13–17 *PhD Science* K–5 curriculum does not cover planets in the solar system.

3.ESS2: Earth's Systems

A. Earth Materials and Systems		**Aligned *PhD Science* Lessons**
3.ESS2.1	Develop a model to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	Level 5 M3 L1–3, 6–13, 19–27
C. The Roles of Water in Earth's Surface Processes		**Aligned *PhD Science* Lessons**
3.ESS2.2	Develop a model to describe the cycling of water through Earth's spheres driven by energy from the sun.	Level 5 M4 L6–8
D. Weather and Climate		**Aligned *PhD Science* Lessons**
3.ESS2.3	Use tables, graphs, and tools to describe precipitation, temperature, and wind (i.e., direction and speed) to determine local weather and climate.	Level 3 M1 L1–15, 19–20, 27–29
3.ESS2.4	Incorporate weather data to describe major climates (e.g., polar, temperate, tropical) in different regions of the world.	Level 3 M1 L11–15, 27–29

3.ESS3 Earth and Human Activity

B. Natural Hazards		**Aligned *PhD Science* Lessons**
3.ESS3.1	Evaluate existing solutions that reduce the impact of natural hazards (e.g., fires, landslides, earthquakes, volcanic eruptions, floods, severe weather) on the environment.	Level 3 M1 L1–3, 16–29

Engineering, Technology, and Applications of Science (ETS)

3.ETS1: Engineering Design

A. Defining and Delimiting Engineering Problems		**Aligned *PhD Science* Lessons**
3.ETS1.1	Design a solution to a real-world problem that includes specified criteria and constraints.	Level 3 M1 L21–26
B. Develop Possible Solutions		**Aligned *PhD Science* Lessons**
3.ETS1.2	Apply evidence or research to support a design solution.	Level 3 M1 L13–15, 18 Level 3 M2 L6–8, 26–28 Level 3 M3 L9–11, 14–15, 21–28 Level 3 M4 L10–14, 19–21, 28–30

Science and Engineering Practices

Asking Questions and Defining Problems	Aligned *PhD Science* Lessons
	Level 3 M1 L1–3, 21–26, 28–29 Level 3 M2 L1–2 Level 3 M3 L1–3, 12–13 Level 3 M4 L1–3, 7–9, 15–16, 19–30

Developing and Using Models	Aligned *PhD Science* Lessons
	Level 3 M1 L1–3, 19–20 Level 3 M2 L1–3, 6–12, 22–25, 27–28 Level 3 M3 L7–11, 21–25, 27–28 Level 3 M4 L1–3, 17–18, 23–30

Planning and Carrying Out Investigations	Aligned *PhD Science* Lessons
	Level 3 M2 L4–5 Level 3 M3 L12–13 Level 3 M4 L7–18, 23–30

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
	Level 3 M1 L4–15, 19–20, 27–29 Level 3 M2 L3–8, 16–19, 27–28 Level 3 M3 L4–9, 14–20, 27–28 Level 3 M4 L7–9

Using Mathematics and Computational Thinking	Aligned *PhD Science* Lessons
	Level 3 M1 L4–12 Level 3 M2 L3, 16–19 Level 3 M3 L7–8 Level 3 M4 L23–27

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
	Level 3 M1 L13–15, 18, 21–29 Level 3 M2 L6–8, 22–28 Level 3 M3 L9–11, 14–15, 21–28 Level 3 M4 L10–14, 19–21, 28–30

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
	Level 3 M1 L21–26, 28–29 Level 3 M2 L9–15, 20–21, 27–28 Level 3 M3 L16–20 Level 3 M4 L12–14

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
	Level 3 M1 L11–17, 28–29 Level 3 M2 L13–15, 20–21 Level 3 M4 L22

Crosscutting Concepts

Patterns	Aligned *PhD Science* Lessons
	Level 3 M1 L11–15, 19–20, 27–29 Level 3 M2 L3–8, 13–15, 27–28 Level 3 M3 L1–8, 14–18, 26–28 Level 3 M4 L1–9, 28–30

Cause and Effect	Aligned *PhD Science* Lessons
	Level 3 M1 L1–3, 16–18, 21–29 Level 3 M2 L9–12, 16–28 Level 3 M3 L9–13, 19–25, 27–28 Level 3 M4 L1–3, 10–30

Scale, Proportion, and Quantity	Aligned *PhD Science* Lessons
	Level 3 M1 L4–10 Level 3 M2 L1–2, 27–28 Level 3 M3 L1–3, 14–15

Systems and System Models	Aligned *PhD Science* Lessons
	Level 3 M1 L1–3, 16–20 Level 3 M2 L6–15, 20–28 Level 3 M3 L9–11 Level 3 M4 L1–30

Energy and Matter	Aligned *PhD Science* Lessons
	Level 4 M2 L1–3, 8–26 Level 4 M3 L10–19, 30–31 Level 5 M1 L5–8, 13–14, 23–26 Level 5 M2 L6–11, 14–19, 24–26 Level 5 M3 L10–11 Level 5 M4 L3–4

Structure and Function	Aligned *PhD Science* Lessons
	Level 3 M2 L1–3, 9–12 Level 3 M3 L4–6, 21–28

Stability and Change	Aligned *PhD Science* Lessons
	Level 3 M1 L4–15, 27–29 Level 3 M2 L16–19 Level 3 M3 L7–8, 12–13, 19–20, 26–28

PhD Science® Correlation to Tennessee Academic Standards for Science: Level 4

The *PhD Science* K–5 curriculum aligns with the Fourth Grade Tennessee Academic Standards for Science. A detailed analysis of alignment appears in the table below.

Key: Module (M), Lesson (L)

Fourth Grade Disciplinary Core Ideas and Component Ideas

Physical Sciences (PS)

4.PS3: Energy

A. Definitions of Energy		**Aligned *PhD Science* Lessons**
4.PS3.1	Use evidence to explain the cause and effect relationship between the speed of an object and the energy of an object.	Level 4 M2 L6–7, 24–26
C. Relationship Between Energy, Forces, and Fields		**Aligned *PhD Science* Lessons**
4.PS3.2	Carry out an investigation to show how faster speeds during a collision can cause a bigger change in the shape of the colliding objects.	Level 4 M2 L1–5, 8–9, 24–26
D. Energy in Chemical Processes and Everyday Life		**Aligned *PhD Science* Lessons**
4.PS3.3	Describe how stored energy can be converted into another form for practical use in a system.	Level 4 M2 L12–26

4.PS4: Waves and Their Applications in Technologies for Information Transfer

A. Wave Properties: Mechanical and Electromagnetic		**Aligned *PhD Science* Lessons**
4.PS4.1	Use a model of a simple wave to describe amplitude [and] wavelength and explain how waves can add or cancel each other as they cross.	Level 4 M3 L7–14, 29–31
B. Electromagnetic Radiation		**Aligned *PhD Science* Lessons**
4.PS4.2	Construct an explanation for how the colors of available light sources and the bending of light waves determine what we see.	Level 4 M4 L1–17, 25–27
C. Information Technologies and Instrumentation		**Aligned *PhD Science* Lessons**
4.PS4.3	Investigate how lenses enhance human senses and digital devices (e.g., computers and cell phones) use waves to receive and decode information over distances.	Level 4 M4 L18–27

Life Sciences (LS)

4.LS2: Ecosystems: Interactions, Energy, and Dynamics

A. Interdependent Relationships in Ecosystems		**Aligned *PhD Science* Lessons**
4.LS2.1	Develop and use models to illustrate the flow of matter through a food web/food chain beginning with sunlight and including producers, consumers, and decomposers.	Level 5 M2 L1–2, 6–14, 20, 24–26.
4.LS2.2	Using information about the roles of organisms (producers, consumers, decomposers) in an ecosystem, evaluate how those roles are interconnected in a food web, and communicate how the organisms are continuously able to meet their needs in a stable food web.	Level 5 M2 L1–2, 8–14, 20, 24–26
4.LS2.3	Develop and use models to determine the effects of introducing a species to, or removing a species from, an ecosystem and how either one can damage the balance of an ecosystem.	Level 5 M2 L20–23
C. Ecosystem Dynamics, Functioning, and Resilience		**Aligned *PhD Science* Lessons**
4.LS2.4	Analyze and interpret data about changes in the environment to explain how some organisms may survive and reproduce, some may not survive, others move to new locations, yet others move into the transformed environment.	Level 3 M2 L16–28 Level 3 M3 L21–28

4.LS4: Biological Change: Unity and Diversity

A. Evidence of Common Ancestry		**Aligned *PhD Science* Lessons**
4.LS4.1	Obtain evaluate, and communicate information about what a fossil is and ways a fossil can provide information about the past, such as a) the nature of environments and b) animals that existed long ago but no longer exist.	Level 3 M2 L1–8, 26–28 Level 4 M1 L1–5, 19–20, 25–27

Earth and Space Sciences (ESS)

4.ESS1: Earth's Place in the Universe

C. The History of Planet Earth		**Aligned *PhD Science* Lessons**
4.ESS1.1	Generate and support a claim with evidence that over long periods of time, erosion (i.e., weathering and transportation) and deposition have changed landscapes and created new landforms.	Level 4 M1 L6–11, 25–27
4.ESS1.2	Use evidence from the presence and location of fossils to determine the order in which rock strata were formed.	Level 4 M1 L1–5, 19–20, 25–27

4.ESS2: Earth's Systems

A. Earth Materials and Systems		**Aligned *PhD Science* Lessons**
4.ESS2.1	Collect and analyze data from observations to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical weathering (e.g., frost wedging, abrasion, tree root wedging) and are transported by water, ice, wind, gravity, and vegetation.	Level 4 M1 L6–11, 25–27
B. Plate Tectonics and Large-Scale System Interactions		**Aligned *PhD Science* Lessons**
4.ESS2.2	Explain how data from maps and other reliable sources can be used to determine patterns for the locations of mountain ranges, deep ocean trenches, volcanoes, and earthquakes.	Level 4 M1 L18–20, 25–27
E. Biogeology		**Aligned *PhD Science* Lessons**
4.ESS2.3	Provide examples to support the claim that organisms affect the physical characteristics of their regions (e.g., plants' roots hold soil in place, beaver shelters alter the flow of water, paved surfaces affect runoff, leaves from trees can obstruct waterways).	Level 4 M1 L12–17, 21–22

4.ESS3: Earth and Human Activity

A. Natural Resources		**Aligned *PhD Science* Lessons**
4.ESS3.1	Obtain and combine information to describe that energy, fuels, and materials are derived from natural resources and that some resources are renewable (e.g., sunlight, wind, water) and some are not (e.g., fossil fuels, minerals).	Level 4 M1 L21–27
C. Human Impacts on Earth Systems		**Aligned *PhD Science* Lessons**
4.ESS3.2	Create an argument, using evidence from research, that human activity (farming, mining, building) can affect the land and ocean in positive and/or negative ways.	Level 4 M1 L12–17, 25–27 Level 5 M3 L14–18, 24–27

Engineering, Technology, and Applications of Science (ETS)

4.ETS1: Engineering Design

C. Optimizing the Design Solution		**Aligned *PhD Science* Lessons**
4.ETS1.1	Categorize the effectiveness of design solutions by comparing them to specified criteria and constraints.	Level 4 M1 L12–17 Level 4 M4 L14–17

4.ETS2: Links Among Engineering, Technology, Science, and Society

B. Influence of Engineering, Technology, and Science on Society and the Natural World		**Aligned *PhD Science* Lessons**
4.ETS2.1	Explain how existing technologies have been designed or improved to increase their benefits, to decrease known risks, and to meet societal demands (e.g., artificial limbs, seatbelts, cell phones).	Level 4 M1 L12–17 Level 4 M2 L15–16 Level 4 M4 L14–17

Science and Engineering Practices

Asking Questions and Defining Problems	Aligned *PhD Science* Lessons
	Level 4 M1 L1–2, 12–17, 23 Level 4 M2 L1–3, 8–9, 11, 17–23, 25–26 Level 4 M3 L1–3, 6, 15–19 Level 4 M4 L1–2, 14–17

Developing and Using Models	Aligned *PhD Science* Lessons
	Level 4 M1 L1–2, 26–27 Level 4 M2 L1–3, 8–11, 15–16, 25–26 Level 4 M3 L1–3, 7–14, 30–31 Level 4 M4 L1–8, 10–24, 26–27

Planning and Carrying Out Investigations	Aligned *PhD Science* Lessons
	Level 4 M1 L8–11, 21–22 Level 4 M2 L6–7, 10–14 Level 4 M3 L15–19 Level 4 M4 L7–9, 14–21, 26–27

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
	Level 4 M1 L12–20, 23–24, 26–27 Level 4 M2 L25–26 Level 4 M4 L10–17

Using Mathematics and Computational Thinking	Aligned *PhD Science* Lessons
	Level 4 M2 L8–9 Level 4 M4 L14–17

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
	Level 4 M1 L3–7, 10, 12–18, 21–22, 25–27 Level 4 M2 L4–5, 15–26 Level 4 M3 L4–5, 24–25, 29–31 Level 4 M4 L14–27

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
	Level 4 M3 L21–23, 26–28, 30–31 Level 4 M4 L7–8

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
	Level 4 M1 L3–5, 23–24 Level 4 M3 L4–6, 10–11, 20–23, 26–28, 30–31 Level 4 M4 L22–24

Crosscutting Concepts

Patterns	Aligned *PhD Science* Lessons
	Level 4 M1 L1–5, 18–20, 26–27 Level 4 M2 L4–5, 8–11, 24–26 Level 4 M3 L1–3, 7–11, 20, 24–31 Level 4 M4 L1–4, 7–8, 14–17, 22–27

Cause and Effect	Aligned *PhD Science* Lessons
	Level 4 M1 L6–17, 21–27 Level 4 M2 L1–7, 10–14, 24–26 Level 4 M3 L6–23, 30–31 Level 4 M4 L3–13, 18–21, 25–27

Scale, Proportion, and Quantity	Aligned *PhD Science* Lessons
	Level 4 M1 L3–5

Systems and System Models	Aligned *PhD Science* Lessons
	Level 4 M1 L1–2, 12–17, 21–24 Level 4 M2 L1–11, 15–26 Level 4 M3 L7–9, 15–19, 21–23, 26–28, 30–31 Level 4 M4 L1–6, 10–27

Energy and Matter	Aligned *PhD Science* Lessons
	Level 4 M2 L1–3, 8–26 Level 4 M3 L10–19, 30–31

Structure and Function	Aligned *PhD Science* Lessons
	Level 4 M3 L4–6, 20, 24–25, 29–31 Level 4 M4 L7–9, 25–27

Stability and Change	Aligned *PhD Science* Lessons
	Level 4 M1 L3–11, 18–20, 25–27

PhD Science® Correlation to Tennessee Academic Standards for Science: Level 5

The *PhD Science* K–5 curriculum aligns with the Fifth Grade Tennessee Academic Standards for Science. A detailed analysis of alignment appears in the table below.

Key: Module (M), Lesson (L)

Fifth Grade Disciplinary Core Ideas and Component Ideas

Physical Sciences (PS)

5.PS1: Matter and Its Interactions

A. Structure and Properties of Matter		**Aligned *PhD Science* Lessons**
5.PS1.1	Analyze and interpret data from observations and measurements of the physical properties of matter to explain phase changes between a solid, liquid, or gas.	Level 5 M1 L1–4, 11–17, 23–26
5.PS1.2	Analyze and interpret data to show that the amount of matter is conserved even when it changes form, including transitions where matter seems to vanish.	Level 5 M1 L9–17, 23–26
B. Chemical Processes		**Aligned *PhD Science* Lessons**
5.PS1.3	Construct an argument using the physical properties of matter that combining substances may or may not result in a new substance.	Level 5 M1 L1–2, 13–26

5.PS2: Motion and Stability: Forces and Interactions

A. Forces, Fields, and Motion		**Aligned *PhD Science* Lessons**
5.PS2.1	Plan and carry out an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of [an] object.	Level 3 M4 L10–18, 28–30
5.PS2.2	Make observations and measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.	Level 3 M4 L1–9, 28–30
B. Types of Interactions		**Aligned *PhD Science* Lessons**
5.PS2.3	Use evidence to support that the gravitational force exerted by Earth on objects is directed toward the Earth's center.	Level 5 M4 L3–4, 24–26
C. Stability and Instability in Physical Systems		**Aligned *PhD Science* Lessons**
5.PS2.4	Explain how forces can create patterns within a system (moving in one direction, shifting back and forth, or moving in cycles), and describe conditions that affect how fast or slowly these patterns occur.	Level 3 M4 L1–9, 28–30

Life Sciences (LS)

5.LS1: From Molecules to Organisms: Structures and Processes

Information Processing		**Aligned *PhD Science* Lessons**
5.LS1.1	Compare and contrast animal responses that are instinctual versus those that are learned by gathering information through the senses, which is then processed and stored as memories to guide their actions.	Level 3 M2 L13–15, 26–28

5.LS3: Heredity: Inheritance and Variation of Traits

A. Inheritance of Traits		**Aligned *PhD Science* Lessons**
5.LS3.1	Distinguish between inherited characteristics and those characteristics that result from a direct interaction with the environment. Apply this concept by giving examples of characteristics of living organisms that are influenced by both inheritance and the environment.	Level 3 M3 L9–13, 19–20
B. Variation of Traits		**Aligned *PhD Science* Lessons**
5.LS3.2	Provide evidence and analyze data that plants and animals have traits inherited from parents and that variations of these traits exist in a group of similar organisms.	Level 3 M3 L1–6, 14–18, 23–28

5.LS4: Biological Change: Unity and Diversity

B. Natural Selection		**Aligned *PhD Science* Lessons**
5.LS4.1	Use evidence to construct an explanation for how variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction.	Level 3 M3 L21–28

Earth and Space Sciences (ESS)

5.ESS1: Earth's Place in the Universe

A. The Universe and Its Stars		**Aligned *PhD Science* Lessons**
5.ESS1.1	Explain that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	Level 5 M4 L18–19, 24–26
5.ESS1.2	Research and explain the position of the Earth and the solar system within the Milky Way galaxy, and compare the size and shape of the Milky Way to other galaxies in the universe.	*PhD Science* K–5 curriculum does not cover the solar system.
B. Earth and the Solar System		**Aligned *PhD Science* Lessons**
5.ESS1.3	Use a model to explain how the orbit of the Earth and sun cause observable patterns: a. day and night, and b. changes in length and direction of shadows over a day.	Level 5 M4 L1–2, 5–17, 20–26
5.ESS1.4	Explain the cause and effect relationship between the positions of the sun, earth, and moon and resulting eclipses, tides, and appearance of the moon.	Level 5 M4 L1–2, 5–17, 20–26 *PhD Science* K–5 curriculum does not cover tides.
5.ESS1.5	Relate the tilt of the Earth's axis, as it revolves around the sun, to the varying intensities of sunlight at different latitudes. Evaluate how this causes changes in day-lengths and seasons.	*PhD Science* K–5 curriculum does not cover Earth's tilt.
5.ESS1.6	Use tools to describe the position of constellations and how they appear to move from the Earth's perspective throughout the seasons.	Level 5 M4 L18–23

Engineering, Technology, and Applications of Science (ETS)

5.ETS1: Engineering Design

B. Developing Possible Solutions		**Aligned *PhD Science* Lessons**
5.ETS1.1	Plan and carry out tests on one or more elements of a prototype in which variables are controlled and failure points are considered to identify which elements need to be improved. Apply the results of tests to redesign the prototype.	Level 5 M3 L19–23

5.ETS2: Links Among Engineering, Technology, Science, and Society

A. Interdependence of Science, Technology, Engineering, and Math (STEM)		**Aligned *PhD Science* Lessons**
5.ETS2.1	Use appropriate tools to make measurements and answer testable questions.	Level 5 M1 L18–22 Level 5 M3 L19–23

Science and Engineering Practices

Asking Questions and Defining Problems	Aligned *PhD Science* Lessons
	Level 5 M1 L1–2 Level 5 M2 L1–2, 21–23 Level 5 M3 L1–3, 19–23 Level 5 M4 L1–2, 13

Developing and Using Models	Aligned *PhD Science* Lessons
	Level 5 M1 L1–2, 5–10, 13–14, 23–26 Level 5 M2 L1–2, 6–7, 14, 20, 25–26 Level 5 M3 L1–3, 6–16, 24–27 Level 5 M4 L1–4, 7–17, 19–26

Planning and Carrying Out Investigations	Aligned *PhD Science* Lessons
	Level 5 M1 L13–14, 18–22, 24–26 Level 5 M2 L3–5 Level 5 M3 L10–11 Level 5 M4 L5–6, 18–19, 25–26

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
	Level 5 M1 L15–17, 24–26 Level 5 M2 L3–5, 8–13, 15–17, 25–26 Level 5 M3 L4–5, 14–16, 25–27 Level 5 M4 L14–15

Using Mathematics and Computational Thinking	Aligned *PhD Science* Lessons
	Level 5 M1 L3–4, 15–17 Level 5 M3 L10–11, 24–27 Level 5 M4 L5–6, 25–26

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
	Level 5 M1 L5–6, 11–12, 18–26 Level 5 M2 L12–13, 15–17, 21–26 Level 5 M3 L17–23, 25–27 Level 5 M4 L3–4, 9–12, 20–21, 22–26

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
	Level 5 M1 L3–4, 24–26 Level 5 M2 L3–5, 8–11, 21–23, 25–26 Level 5 M3 L19–23, 25–27 Level 5 M4 L5–6, 13–17, 20–21, 24–26

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
	Level 5 M2 L6–7, 10–11, 18–20, 25–26 Level 5 M3 L9, 14–16, 19–27 Level 5 M4 L18–19

Crosscutting Concepts

Patterns	Aligned *PhD Science* Lessons
	Level 5 M1 L7–8 Level 5 M2 L1–5, 8–9, 15–17, 25–26 Level 5 M3 L6–9 Level 5 M4 L1–17, 20–26

Cause and Effect	Aligned *PhD Science* Lessons
	Level 5 M1 L1–2, 5–6, 9–10, 18–22, 24–26 Level 5 M2 L3–7, 12–13, 18–23, 25–26 Level 5 M3 L6–8, 12–18, 25–27 Level 5 M4 L5–6, 24–26

Scale, Proportion, and Quantity	Aligned *PhD Science* Lessons
	Level 5 M1 L3–4, 13–17, 23–26 Level 5 M2 L10–11 Level 5 M3 L1–5, 10–11, 24–27 Level 5 M4 L18–19, 24–26

Systems and System Models	Aligned *PhD Science* Lessons
	Level 5 M1 L3–4, 15–17 Level 5 M2 L1–2, 6–11, 14, 18–19, 24–26 Level 5 M3 L1–9, 12–13, 19–27 Level 5 M4 L1–2, 7–26

Energy and Matter	Aligned *PhD Science* Lessons
	Level 5 M1 L5–8, 13–14, 23–26 Level 5 M2 L6–11, 14–19, 24–26 Level 5 M3 L10–11 Level 5 M4 L3–4

Structure and Function	Aligned *PhD Science* Lessons
	Level 3 M2 L1–3, 9–12 Level 3 M3 L4–6, 21–28 Level 4 M4 L7–9, 25–27

Stability and Change	Aligned *PhD Science* Lessons
	Level 5 M1 L1–2, 9–12, 18–26 Level 5 M2 L12–13, 20, 24–26 Level 5 M3 L14–18 Level 5 M4 L5–6, 9–12, 24–26