PhD Science® K–5 Curriculum Correlation to the Oklahoma Academic Standards for Science (OAS-S)

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K–2 Grade Band

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PhD Science® Correlation to the Oklahoma Academic Standards for Science (OAS-S): Level K

The *PhD Science* Level K curriculum aligns fully with the Kindergarten OAS-S. A detailed analysis of alignment appears below.

Key: Module (M), Lesson (L)

Kindergarten Performance Expectations

Physical Science (PS)

Motion and Stability of Forces (PS2)		**Aligned *PhD Science* Lessons**
K.PS2.1	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.	Level K M2 L1–23
K.PS2.2	Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or pull.	Level K M2 L17–23

Energy (PS3)		**Aligned *PhD Science* Lessons**
K.PS3.1	Make observations to determine the effect of sunlight on Earth's surface.	Level K M1 L8–11, 28–30
K.PS3.2	Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.	Level K M1 L12–16, 28–30

Life Science (LS)

From Molecules to Organisms: Structure and Function (LS1)		**Aligned *PhD Science* Lessons**
K.LS1.1	Use observations to describe patterns of what plants and animals (including humans) need to survive.	Level K M3 L4–16, 19–22, 27–29

Earth and Space Systems (ESS)

Earth Systems (ESS2)		**Aligned *PhD Science* Lessons**
K.ESS2.1	Use and share observations of local weather conditions to describe patterns over time.	Level K M1 L1–11, 17–24, 28–30 Level K M4 L25
K.ESS2.2	Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.	Level K M4 L1–10, 14–16, 26–28

Earth and Human Activity (ESS3)		**Aligned *PhD Science* Lessons**
K.ESS3.1	Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.	Level K M3 L1–3, 9–29 Level K M4 L1–2, 8–9, 11–13
K.ESS3.2	Ask questions to understand the purpose of weather forecasting to prepare for and respond to severe weather.	Level K M1 L22–30

Science and Engineering Practices

Asking Questions and Defining Problems	**Aligned *PhD Science* Lessons**
Ask questions based on observations to find more information about the natural and/or designed world(s).	Level K M1 L1–3, 22–26 Level K M2 L1–3, 9 Level K M3 L1–3, 14–16, 27–29

Developing and Using Models	**Aligned *PhD Science* Lessons**
Use a model to represent relationships in the natural world.	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
With guidance, plan and conduct an investigation in collaboration with peers.	Level K M2 L7–8, 10–15 Level K M3 L4–8
Make observations (firsthand or from media) to collect data that can be used to make comparisons.	Level K M1 L4–7, 10–11, 17–24, 27–30 Level K M2 L7–8, 16–23 Level K M3 L21

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.	Level K M3 L4–8, 14–20, 22–26 Level K M4 L25
Analyze data from tests of an object or tool to determine if it works as intended.	Level K M4 L20–24

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.	Level K M2 L17–20

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
Construct an argument with evidence to support a claim.	Level K M3 L17–21, 27–29 Level K M4 L11–13, 27–28

Disciplinary Core Ideas

Physical Science (PS)

PS2 Motion and Stability of Forces	**Aligned *PhD Science* Lessons**
Pushes and pulls can have different strengths and directions.	Level K M2 L7–23
Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.	Level K M2 L1–23
A bigger push or pull makes things speed up or slow down more quickly.	Level K M2 L7–9, 21–23
When objects touch or collide, they push on one another and can change motion.	Level K M2 L13–23

PS3 Energy	**Aligned *PhD Science* Lessons**
Sunlight warms the Earth's surface.	Level K M1 L8–16, 28–30

Life Science (LS)

LS1 From Molecules to Organisms: Structure and Function	**Aligned *PhD Science* Lessons**
All animals need food in order to live and grow.	Level K M3 L4–16, 19–20, 22, 27–29
Animals obtain their food from plants or from other animals.	Level K M3 L4–16, 19–20, 22, 27–29
Plants need water and light to live and grow.	Level K M3 L4–16, 19–22, 27–29

Earth and Space Science (ESS)

ESS2 Earth Systems	**Aligned *PhD Science* Lessons**
Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time.	Level K M1 L1–11, 17–24, 28–30 Level K M4 L25
People measure these conditions to describe and record the weather and to notice patterns over time.	Level K M1 L1–11, 17–24, 28–30 Level K M4 L25
Plants and animals can change their environment.	Level K M4 L1–10, 14–16, 26–28
Things that people do to live comfortably can affect the world around them.	Level K M4 L11–24, 26–28
ESS3 Earth and Human Activity	**Aligned *PhD Science* Lessons**
Living things need water, air, and resources from the land, and they live in places that have the things they need.	Level K M3 L1–3, 9–29 Level K M4 L1–5, 8–9, 11–16
Humans use natural resources for everything they do.	Level K M3 L1–3, 9–29 Level K M4 L1–5, 8–9, 11–16
Some kinds of severe weather are more likely than others in a given region.	Level K M1 L17–20, 22–30
Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.	Level K M1 L17–20, 22–30

Engineering, Technology, and Applications of Science (ETS)

ETS1 Engineering Design	**Aligned *PhD Science* Lessons**
A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.	Level K M1 L4–7, 12–16 Level K M2 L17–20

ETS2 Links Among Engineering, Technology, Science, and Society	**Aligned *PhD Science* Lessons**
People depend on various technologies in their lives; human life would be very different without technology.	Level K M4 L18–19
People encounter questions about the natural world every day.	Level K M3 L1–3 Level K M4 L25

Crosscutting Concepts

Patterns	**Aligned *PhD Science* Lessons**
Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.	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**
Events have causes that generate observable patterns.	Level K M2 L4–9, 13–16, 21–23 Level K M3 L28–29 Level K M4 L3–5, 10, 14–19, 26–28
Simple tests can be designed to gather evidence to support or refute student ideas about causes.	Level K M2 L10–12, 17–20

Systems and System Models	**Aligned *PhD Science* Lessons**
Systems in the natural and designed world have parts that work together.	Level K M3 L1–3, 9–13, 19–21, 23–25, 27–29 Level K M4 L1–9, 11–16

PhD Science® Correlation to the Oklahoma Academic Standards for Science (OAS-S): Level 1

The *PhD Science* Level 1 curriculum aligns fully with the Grade 1 OAS-S. A detailed analysis of alignment appears below.

Key: Module (M), Lesson (L)

Grade 1 Performance Expectations

Physical Science (PS)

Waves and Their Applications in Technologies for Information Transfer (PS4)		**Aligned *PhD Science* Lessons**
1.PS4.1	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.	Level 1 M3 L1–17, 26–29
1.PS4.2	Make observations to construct an evidence-based account that objects can be seen only when illuminated.	Level 1 M2 L1–9, 21–23
1.PS4.3	Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.	Level 1 M2 L1–3, 10–23
1.PS4.4	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.	Level 1 M3 L18–29

Life Science (LS)

From Molecules to Organisms: Structure and Function (LS1)		Aligned *PhD Science* Lessons
1.LS1.1	Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.	Level 1 M1 L1–21, 27–29
1.LS1.2	Obtain information from media and/or text to determine patterns in the behavior of parents and offspring that help offspring survive.	Level 1 M1 L24–29

Heredity: Inheritance and Variation of Traits (LS3)		Aligned *PhD Science* Lessons
1.LS3.1	Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.	Level 1 M1 L22–23, 26–29

Earth and Space Science (ESS)

Earth's Place in the Universe (ESS1)		Aligned *PhD Science* Lessons
1.ESS1.1	Use observations of the sun, moon, and stars to describe patterns that can be predicted.	Level 1 M4 L1–8, 14–25
1.ESS1.2	Make observations at different times of year to relate the amount of daylight and relative temperature to the time of year.	Level 1 M4 L9–13, 23–25

Earth and Human Activity (ESS3)		Aligned *PhD Science* Lessons
1.ESS3.1	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.	Level K M4 L14–24, 26–28

Science and Engineering Practices

Planning and Carrying Out Investigations	**Aligned *PhD Science* Lessons**
Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.	Level 1 M1 L19–20 Level 1 M2 L15–18
Make observations (firsthand or from media) to collect data that can be used to make comparisons.	Level 1 M2 L4–12, 15–18, 22–23 Level 1 M3 L1–7, 11–13, 18–19 Level 1 M4 L4–6, 14–16, 19–21

Analyzing and Interpreting Data	**Aligned *PhD Science* Lessons**
Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.	Level 1 M1 L16–21, 27–29 Level 1 M2 L1–9 Level 1 M3 L10 Level 1 M4 L4–6, 9–13

Constructing Explanations and Designing Solutions	**Aligned *PhD Science* Lessons**
Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	Level 1 M1 L7–8, 16–17, 22–23, 26–29 Level 1 M2 L4–7, 21–23 Level 1 M3 L4–6, 14, 26–29
Use tools and materials provided to design a device that solves a specific problem.	Level 1 M1 L11–15

Obtaining, Evaluating, and Communicating Information	**Aligned *PhD Science* Lessons**
Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.	Level 1 M1 L24–25 Level 1 M3 L18–19 Level 1 M4 L9–13, 24–25
Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.	Level 1 M1 L27–29 Level 1 M2 L21–23 Level 1 M3 L26–29 Level 1 M4 L23–25

Disciplinary Core Ideas

Physical Science (PS)

PS4 Waves and Their Applications in Technologies for Information Transfer	**Aligned *PhD Science* Lessons**
Sound can make matter vibrate, and vibrating matter can make sound.	Level 1 M3 L1–17, 26–29
Objects can be seen if light is available to illuminate them or if they give off their own light.	Level 1 M2 L1–9, 21–23
Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach.	Level 1 M2 L1–3, 10–23
Mirrors can be used to redirect a light beam.	Level 1 M2 L13–14
People also use a variety of devices to communicate (send and receive information) over long distances.	Level 1 M3 L18–29

Life Science (LS)

LS1 From Molecules to Organisms: Structure and Function	**Aligned *PhD Science* Lessons**
All organisms have external parts.	Level 1 M1 L1–15, 27–29
Different animals use their body parts 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
Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.	Level 1 M1 L1–15, 27–29
Animals have body parts that capture and convey different kinds of information needed for growth and survival.	Level 1 M1 L16–21, 27–29
Plants also respond to some external inputs.	Level 1 M1 L16–21, 27–29
Adult plants and animals can have young.	Level 1 M1 L24–29
In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.	Level 1 M1 L24–29

LS3 Heredity: Inheritance and Variation of Traits	Aligned *PhD Science* Lessons
Young animals are very much, but not exactly, like their parents.	Level 1 M1 L22–23, 26–29
Plants also are very much, but not exactly, like their parents.	Level 1 M1 L22–23, 26–29
Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.	Level 1 M1 L22–23, 27–29

Earth and Space Science (ESS)

ESS1 Earth's Place in the Universe	Aligned *PhD Science* Lessons
Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.	Level 1 M4 L1–8, 14–25
Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	Level 1 M4 L9–13, 23–25

ESS3 Earth and Human Activity	Aligned *PhD Science* Lessons
Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.	Level K M4 L11–24, 26–28

Engineering, Technology, and Applications of Science (ETS)

ETS1 Engineering Design	Aligned *PhD Science* Lessons
Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	Level 1 M3 L21–25

ETS2 Links Among Engineering, Technology, Science, and Society	Aligned *PhD Science* Lessons
People depend on various technologies in their lives; human life would be very different without technology.	Level 1 M3 L20
Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.	Level 1 M1 L10–15

Crosscutting Concepts

Patterns	**Aligned *PhD Science* Lessons**
Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.	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**
Events have causes that generate observable patterns.	Level 1 M2 L1–7, 10–12, 15–23 Level 1 M3 L4–6, 14, 17, 26–29 Level 1 M4 L4–6, 9–13, 17–21, 23–25
Simple tests can be designed to gather evidence to support or refute student ideas about causes.	Level 1 M2 L13–14 Level 1 M3 L7, 15–16

Structure and Function	**Aligned *PhD Science* Lessons**
The shape and stability of structures of natural and designed objects are related to their functions.	Level 1 M1 L4–15, 27–29 Level 1 M3 L8–9

PhD Science® Correlation to the Oklahoma Academic Standards for Science (OAS-S): Level 2

The *PhD Science* Level 2 curriculum aligns fully with the Grade 2 OAS-S. A detailed analysis of alignment appears below.

Key: Module (M), Lesson (L)

Grade 2 Performance Expectations

Physical Science (PS)

Matter and Its Interactions (PS1)		**Aligned *PhD Science* Lessons**
2.PS1.1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	Level 2 M1 L1–9, 12–16, 19, 23, 29–31 Level 2 M2 L3–4, 14–17
2.PS1.2	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for the intended purpose.	Level 2 M1 L20–31
2.PS1.3	Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.	Level 2 M1 L10–11, 29–31
2.PS1.4	Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	Level 2 M1 L14–19, 29–31

Life Science (LS)

Ecosystems: Interactions, Energy, and Dynamics (LS2)		**Aligned *PhD Science* Lessons**
2.LS2.1	Plan and conduct an investigation to determine if plants need sunlight and water to grow.	Level 2 M3 L1–7, 25–29
2.LS2.2	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.	Level 2 M3 L8–29

Biological Unity and Diversity (LS4)		**Aligned *PhD Science* Lessons**
2.LS4.1	Make observations of plants and animals to compare the diversity of life in different habitats.	Level 2 M4 L1–3, 7–25

Earth and Space Science (ESS)

Earth's Place in the Universe (ESS1)		**Aligned *PhD Science* Lessons**
2.ESS1.1	Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	Level 2 M2 L18–24

Earth's Systems (ESS2)		**Aligned *PhD Science* Lessons**
2.ESS2.1	Compare 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
2.ESS2.2	Develop a model to represent the shape and kind of land and bodies of water in an area.	Level 2 M2 L1–2, 5–6 Level 2 M4 L1–6, 11–16, 20–21, 23–25
2.ESS2.3	Obtain information to identify where water is found on Earth and that it can be solid or liquid.	Level 2 M4 L1–6, 16, 22–25

Science and Engineering Practices

Developing and Using Models	**Aligned *PhD Science* Lessons**
Develop a model to represent patterns in the natural world.	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, 19–20, 23–29 Level 2 M4 L1–3, 7–8
Develop a simple model based on evidence to represent a proposed object or tool.	Level 2 M3 L14–18

Planning and Carrying Out Investigations	**Aligned *PhD Science* Lessons**
Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.	Level 2 M2 L8–12 Level 2 M3 L3–7 Level 2 M4 L17–19
Make observations (firsthand or from media) to collect data that can be used to make comparisons.	Level 2 M1 L1–3, 29–31 Level 2 M2 L1–6, 14–19 Level 2 M3 L3–6, 8–11, 13, 21–22, 25–29 Level 2 M4 L16–19

Analyzing and Interpreting Data	**Aligned *PhD Science* Lessons**
Analyze data from tests of an object or tool to determine if it works as intended.	Level 2 M1 L20–22, 24–28 Level 2 M3 L14–18

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	Level 2 M1 L8–9, 12–13, 17–19, 23, 29–31 Level 2 M2 L3–4, 7, 13, 22–24 Level 2 M4 L23–25
Compare multiple solutions to a problem.	Level 2 M2 L8–12, 14–17

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
Construct an argument with evidence to support a claim.	Level 2 M2 L3–4, 10–13, 21–24 Level 2 M4 L16

Disciplinary Core Ideas

Physical Science (PS)

PS1 Matter and Its Interactions	Aligned *PhD Science* Lessons
Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature.	Level 2 M1 L1–16, 19, 23, 29–31 Level 2 M2 L3–4, 14–17
Matter can be described and classified by its observable properties.	Level 2 M1 L1–16, 19, 23, 29–31 Level 2 M2 L3–4, 14–17
Different properties are suited to different purposes.	Level 2 M1 L20–31
A great variety of objects can be built up from a small set of pieces.	Level 2 M1 L10–11, 24–31
Heating or cooling a substance may cause changes that can be observed.	Level 2 M1 L14–19, 29–31
Sometimes these changes are reversible, and sometimes they are not.	Level 2 M1 L14–19, 29–31

Life Science (LS)

LS2 Ecosystems: Interactions, Energy and Dynamics	Aligned *PhD Science* Lessons
Plants depend on water and light to grow.	Level 2 M3 L1–7, 25–29
Plants depend on animals for pollination or to move their seeds around.	Level 2 M3 L8–29

LS4 Biological Unity and Diversity	Aligned *PhD Science* Lessons
There are many different kinds of living things in any area, and they exist in different places on land and in water.	Level 2 M4 L1–3, 7–25

Earth and Space Science (ESS)

ESS1 Earth's Place in the Universe	Aligned *PhD Science* Lessons
Some events happen very quickly; others occur very slowly over a time period much longer than one can observe.	Level 2 M2 L18–24

ESS2 Earth's Systems	Aligned *PhD Science* Lessons
Wind and water can change the shape of the land.	Level 2 M2 L1–17, 20, 22–24
Maps show where things are located.	Level 2 M2 L1–2, 5–6 Level 2 M4 L1–6, 11–16, 20–21, 23–25
One can map the shapes and kinds of land and water in any area.	Level 2 M2 L1–2, 5–6 Level 2 M4 L1–6, 11–16, 20–21, 23–25
Water is found in the oceans, rivers, lakes, and ponds.	Level 2 M4 L1–6, 16, 22–25
Water exists as solid ice and in liquid form.	Level 2 M4 L1–6, 16, 22–25

Engineering, Technology, and Applications of Science (ETS)

ETS1 Engineering Design	**Aligned *PhD Science* Lessons**
Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	Level 2 M3 L14–18
Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	Level 2 M2 L8–12, 14–17

ETS2 Links Among Engineering, Technology, Science, and Society	**Aligned *PhD Science* Lessons**
Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.	Level 2 M2 L14–17 Level 2 M3 L14–18
Developing and using technology has impacts on the natural world.	Level 2 M2 L8–9

Crosscutting Concepts

Patterns	**Aligned *PhD Science* Lessons**
Patterns in the natural and human-designed world can be observed.	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**
Events have causes that generate observable patterns.	Level 2 M1 L14–19, 29–31 Level 2 M2 L20–21 Level 2 M3 L8–11
Simple tests can be designed to gather evidence to support or refute student ideas about causes.	Level 2 M1 L14–18 Level 2 M2 L8–12 Level 2 M3 L3–7

Systems and System Models	Aligned *PhD Science* Lessons
A system is an organized group of related objects or components.	Level 2 M1 L1–7, 12–13, 20–23, 29–31 Level 2 M2 L3–4, 7 Level 2 M3 L8–13, 19–24

Energy and Matter	Aligned *PhD Science* Lessons
Objects may break into smaller pieces and be put together into larger pieces or change shapes.	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24

Structure and Function	Aligned *PhD Science* Lessons
The shape and stability of structures of natural and designed objects are related to their function(s).	Level 2 M1 L24–28 Level 2 M2 L14–17 Level 2 M3 L8–11, 14–22

Stability and Change	Aligned *PhD Science* Lessons
Things may change slowly or rapidly.	Level 2 M2 L18–24

PhD Science® Correlation to the Oklahoma Academic Standards for Science (OAS-S): Level 3

The *PhD Science* Level 3 curriculum aligns fully with the Grade 3 OAS-S. A detailed analysis of alignment appears below.

Key: Module (M), Lesson (L)

Grade 3 Performance Expectations

Physical Science (PS2)

Motion and Stability: Forces and Interactions (PS2)		**Aligned *PhD Science* Lessons**
3.PS2.1	Plan and conduct investigations on the effects of balanced and unbalanced forces on the motion of an object.	Level 3 M4 L10–18, 28–30
3.PS2.2	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.	Level 3 M4 L1–9, 28–30
3.PS2.3	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.	Level 3 M4 L19–21, 28–30
3.PS2.4	Define a simple design problem that can be solved by applying scientific ideas about magnets.	Level 3 M4 L22–30

Life Science (LS)

From Molecules to Organisms: Structure and Function (LS1)		Aligned *PhD Science* Lessons
3.LS1.1	Develop and use models to describe that organisms have unique and diverse life cycles but all have a common pattern of birth, growth, reproduction, and death.	Level 3 M3 L7–8, 23–28

Ecosystems: Interactions, Energy, and Dynamics (LS2)		Aligned *PhD Science* Lessons
3.LS2.1	Construct an argument that some animals form groups that help members survive.	Level 3 M2 L13–15, 26–28
Heredity: Inheritance and Variation of Traits (LS3)		**Aligned *PhD Science* Lessons**
3.LS3.1	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Level 3 M3 L1–6, 14–18, 26–28
3.LS3.2	Use evidence to support the explanation that traits can be influenced by the environment.	Level 3 M3 L9–13, 19–20, 26–28

Biological Unity and Diversity (LS4)		Aligned *PhD Science* Lessons
3.LS4.1	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.	Level 3 M2 L1–8, 26–28
3.LS4.2	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving and reproducing.	Level 3 M3 L21–28
3.LS4.3	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	Level 3 M2 L1–2, 9–12, 16–19, 22–28
3.LS4.4	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	Level 3 M2 L16–28

Earth and Space Science (ESS)

Earth's Systems (ESS2)		**Aligned *PhD Science* Lessons**
3.ESS2.1	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	Level 3 M1 L1–15, 19–20, 27–29
3.ESS2.2	Obtain and combine information to describe climates in different regions of the world.	Level 3 M1 L11–15, 27–29

Earth and Human Activity (ESS3)		**Aligned *PhD Science* Lessons**
3.ESS3.1	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	Level 3 M1 L1–3, 16–29

Science and Engineering Practices

Asking Questions and Defining Problems	**Aligned *PhD Science* Lessons**
Ask questions that can be investigated based on patterns such as cause and effect relationships.	Level 3 M1 L1–3 Level 3 M2 L1–2 Level 3 M3 L1–3 Level 3 M4 L1–3, 7–9, 28–30
Define a simple problem that can be solved through the development of a new or improved object or tool.	Level 3 M1 L21–26, 28–29 Level 3 M4 L23–27

Developing and Using Models	**Aligned *PhD Science* Lessons**
Develop models to describe phenomena.	Level 3 M1 L1–3, 19–20 Level 3 M2 L9–12, 27–28 Level 3 M3 L7–11, 21–25, 27–28 Level 3 M4 L1–3, 17–18, 28–30

Planning and Carrying Out Investigations	Aligned *PhD Science* Lessons
Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	Level 3 M4 L7–9, 15–16, 23–27, 29–30
Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	Level 3 M2 L4–5 Level 3 M4 L7–18, 29–30

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.	Level 3 M1 L4–12 Level 3 M3 L7–8, 27–28 Level 3 M4 L4–9
Analyze and interpret data to make sense of phenomena, using logical reasoning.	Level 3 M1 L11–15, 19–20, 27–29 Level 3 M2 L3–8, 16–19, 27–28 Level 3 M3 L4–6, 14–18, 27–28

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
Use evidence (e.g., observations, patterns) to construct or support an explanation.	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

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
Construct and/or support an argument with evidence, data, and/or a model.	Level 3 M2 L9–15, 27–28 Level 3 M3 L16–18
Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	Level 3 M1 L21–26, 28–29 Level 3 M2 L20–21

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
Obtain and combine information from books and other reliable media to explain phenomena.	Level 3 M1 L11–17, 28–29

Disciplinary Core Ideas

Physical Science (PS)

PS2 Motion and Stability: Forces and Interactions	**Aligned *PhD Science* Lessons**
Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion.	Level 3 M4 L10–18, 28–30
Objects in contact exert forces on each other.	Level 3 M4 L10–18, 28–30
The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.	Level 3 M4 L1–9, 28–30
Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.	Level 3 M4 L19–30

Life Science (LS)

LS1 From Molecules to Organisms: Structure and Function	**Aligned *PhD Science* Lessons**
Reproduction is essential to the continued existence of every kind of organism.	Level 3 M3 L7–8, 23–28
Plants and animals have unique and diverse life cycles.	Level 3 M2 L17 Level 3 M3 L23–28

LS2 Ecosystems: Interactions, Energy, and Dynamics	**Aligned *PhD Science* Lessons**
Being part of a group helps animals obtain food, defend themselves, and cope with changes.	Level 3 M2 L13–15, 26–28
Groups may serve different functions and vary dramatically in size.	Level 3 M2 L13–15, 26–28

LS3 Heredity: Inheritance and Variation of Traits	Aligned *PhD Science* Lessons
Many characteristics of organisms are inherited from their parents.	Level 3 M3 L14–18, 26–28
Different organisms vary in how they look and function because they have different inherited information.	Level 3 M3 L1–6, 14–18, 23–28
Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.	Level 3 M3 L9–13, 19–20, 26–28
The environment also affects the traits that an organism develops.	Level 3 M3 L9–13, 19–20

LS4 Biological Unity and Diversity	Aligned *PhD Science* Lessons
Some kinds of plants and animals that once lived on Earth are no longer found anywhere.	Level 3 M2 L6–8, 26–28
Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.	Level 3 M2 L1–8, 26–28
Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.	Level 3 M3 L21–28
For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.	Level 3 M2 L1–2, 9–12, 16–19, 22–28
Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.	Level 3 M2 L16–21
When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.	Level 3 M2 L16–28
Populations live in a variety of habitats, and change in those habitats affects the organisms living there.	Level 3 M2 L16–28

Earth and Space Science (ESS)

ESS2 Earth's Systems	**Aligned *PhD Science* Lessons**
Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.	Level 3 M1 L1–15, 19–20, 27–29
Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years to centuries.	Level 3 M1 L11–15, 27–29

ESS3 Earth and Human Activity	**Aligned *PhD Science* Lessons**
A variety of natural hazards result from natural processes.	Level 3 M1 L1–3, 16–29
Humans cannot eliminate natural hazards but can take steps to reduce their impacts.	Level 3 M1 L18, 21–29

Engineering, Technology, and Applications of Science (ETS)

ETS2 Links Among Engineering, Technology, Science, and Society	**Aligned *PhD Science* Lessons**
Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.	Level 3 M4 L23–27
Knowledge of relevant scientific concepts and research findings is important in engineering.	Level 3 M2 L22–25
Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.	Level 3 M2 L22–25

Crosscutting Concepts

Patterns	**Aligned *PhD Science* Lessons**
Similarities and differences in patterns can be used to sort and classify natural phenomena.	Level 3 M3 L1–8, 14–15, 27–28 Level 3 M4 L29–30
Patterns of change can be used to make predictions.	Level 3 M1 L11–15, 19–20, 27–29 Level 3 M3 L7–8 Level 3 M4 L1–9, 28–30

Cause and Effect	**Aligned *PhD Science* Lessons**
Cause and effect relationships are routinely identified, tested, and used to explain change.	Level 3 M1 L16–18, 21–26, 28–29 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**
Observable phenomena exist from very short to very long time periods.	Level 3 M2 L1–2, 27–28 Level 3 M3 L1–3

Systems and System Models	**Aligned *PhD Science* Lessons**
A system can be described in terms of its components and their interactions.	Level 3 M1 L1–3, 16–20 Level 3 M2 L6–15, 20–28 Level 3 M3 L9–11 Level 3 M4 L1–30

PhD Science® Correlation to the Oklahoma Academic Standards for Science (OAS-S): Level 4

The *PhD Science* Level 4 curriculum aligns fully with the Grade 4 OAS-S. A detailed analysis of alignment appears below.

Key: Module (M), Lesson (L)

Grade 4 Performance Expectations

Physical Science (PS)

Energy (PS3)		**Aligned *PhD Science* Lessons**
4.PS3.1	Use evidence to construct an explanation relating the speed of an object to the energy of that object.	Level 4 M2 L6–7, 24–26
4.PS3.2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	Level 4 M2 L1–5, 10–11, 24–26
4.PS3.3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.	Level 4 M2 L8–9, 24–26
4.PS3.4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	Level 4 M2 L12–26

Waves and Their Applications in Technologies for Information Transfer (PS4)		**Aligned *PhD Science* Lessons**
4.PS4.1	Develop and use a model of waves to describe patterns in terms of amplitude and wavelength, and to show that waves can cause objects to move.	Level 4 M3 L7–14, 29–31
4.PS4.2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	Level 4 M4 L1–17, 25–27
4.PS4.3	Generate and compare multiple solutions that use patterns to transfer information.	Level 4 M4 L18–27

Life Science (LS)

From Molecules to Organisms: Structure and Processes (LS1)		Aligned *PhD Science* Lessons
4.LS1.1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Level 4 M3 L1–6, 20, 26–31
4.LS1.2	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.	Level 4 M3 L1–6, 15–25, 29–31

Earth and Space Science (ESS)

Earth's Place in the Universe (ESS1)		Aligned *PhD Science* Lessons
4.ESS1.1	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.	Level 4 M1 L1–5, 19–20, 25–27

Earth's Systems (ESS2)		Aligned *PhD Science* Lessons
4.ESS2.1	Plan and conduct investigations on the effects of water, ice, wind, and vegetation on the relative rate of weathering and erosion.	Level 4 M1 L6–11, 25–27
4.ESS2.2	Analyze and interpret data from maps to describe patterns of Earth's features.	Level 4 M1 L18–20, 25–27

Earth and Human Activity (ESS3)		Aligned *PhD Science* Lessons
4.ESS3.1	Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment.	Level 4 M1 L21–27
4.ESS3.2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	Level 4 M1 L12–17, 25–27

Science and Engineering Practices

Asking Questions and Defining Problems	**Aligned *PhD Science* Lessons**
Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.	Level 4 M1 L1–2, 23 Level 4 M2 L1–3, 8–9, 11, 25–26 Level 4 M3 L1–3, 6 Level 4 M4 L1–2

Developing and Using Models	**Aligned *PhD Science* Lessons**
Develop a model using an analogy, example, or abstract representation to describe a scientific principle.	Level 4 M1 L1–2, 26–27 Level 4 M2 L1–3, 8–11, 25–26 Level 4 M3 L1–3, 7–14, 30–31 Level 4 M4 L1–2
Develop a model to describe phenomena.	Level 4 M1 L1–2, 26–27 Level 4 M2 L1–3, 8–9, 25–26 Level 4 M3 L1–3 Level 4 M4 L1–6
Use a model to test interactions concerning the functioning of a natural system.	Level 4 M3 L7–11 Level 4 M4 L10–13, 18–24

Planning and Carrying Out Investigations	**Aligned *PhD Science* Lessons**
Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.	Level 4 M1 L6–11, 21–22 Level 4 M2 L10–14 Level 4 M3 L15–19 Level 4 M4 L9, 26–27
With guidance, plan and conduct an investigation with peers.	Level 4 M1 L8–11 Level 4 M2 L6–7 Level 4 M3 L15–19 Level 4 M4 L7–8, 18–21

Analyzing and Interpreting Data	Aligned *PhD Science* Lessons
Analyze and interpret data to make sense of phenomena, using logical reasoning.	Level 4 M1 L12–20, 23–24, 26–27 Level 4 M2 L25–26 Level 4 M4 L10–13

Constructing Explanations and Designing Solutions	Aligned *PhD Science* Lessons
Use evidence (e.g., measurements, observations, patterns) to construct an explanation.	Level 4 M1 L3–5, 25–27 Level 4 M2 L4–5, 15–16, 24–26 Level 4 M3 L4–5, 24–25, 29–31 Level 4 M4 L25–27
Identify the evidence that supports particular points in an explanation.	Level 4 M1 L3–5, 10, 18, 21–22, 25–27
Apply scientific ideas to solve design problems.	Level 4 M2 L17–23 Level 4 M4 L14–17, 26–27
Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	Level 4 M1 L12–17 Level 4 M4 L14–17, 22–24

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
Construct an argument with evidence, data, and/or a model.	Level 4 M3 L21–23, 26–28, 30–31

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
Obtain and combine information from books and other reliable media to explain phenomena.	Level 4 M1 L3–5, 23–24 Level 4 M3 L4–6, 10–11, 20–23, 26–28

Disciplinary Core Ideas

Physical Science

PS3 Energy	**Aligned *PhD Science* Lessons**
The faster a given object is moving, the more energy it possesses.	Level 4 M2 L6–9, 12–16, 24–26
Energy can be moved from place to place by moving objects or through sound, light, or electric currents.	Level 4 M2 L1–3, 10–11, 15–16, 24–26
Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.	Level 4 M2 L1–5, 8–9, 24–26
Light also transfers energy from place to place.	Level 4 M2 L10–11, 24–26
Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.	Level 4 M2 L1–3, 10–26
When objects collide, the contact forces transfer energy so as to change the objects' motions.	Level 4 M2 L8–9, 24–26
The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.	Level 4 M2 L12–14, 24–26

PS4 Waves and Their Applications in Technologies for Information Transfer	**Aligned *PhD Science* Lessons**
Waves, which are regular patterns of motion, can be made in water by disturbing the surface.	Level 4 M3 L7–14, 29–31
When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach.	Level 4 M3 L7–11, 29–31
Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).	Level 4 M3 L7–14, 29–31
An object can be seen when light reflected from its surface enters the eyes.	Level 4 M4 L1–17, 25–27
Digitized information can be transmitted over long distances without significant degradation.	Level 4 M4 L18–27
High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.	Level 4 M4 L22–27

Life Science (LS)

LS1 From Molecules to Organisms: Structure and Processes	Aligned *PhD Science* Lessons
Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	Level 4 M3 L1–6, 20, 26–31
Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain.	Level 4 M3 L1–6, 15–25, 29–31
Animals are able to use their perceptions and memories to guide their actions.	Level 4 M3 L1–6, 20–25, 29–31

Earth and Space Science (ESS)

ESS1 Earth's Place in the Universe	Aligned *PhD Science* Lessons
Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes.	Level 4 M1 L1–5, 19–20, 25–27
The presence and location of certain fossil types indicate the order in which rock layers were formed.	Level 4 M1 L3–5, 25–27

ESS2 Earth's Systems	Aligned *PhD Science* Lessons
Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.	Level 4 M1 L6–11, 25–27
The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns.	Level 4 M1 L18–20, 25–27
Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans.	Level 4 M1 L18–20, 25–27
Major mountain chains form inside continents or near their edges.	Level 4 M1 L18–20, 25–27
Maps can help locate the different land and water features where people live and in other areas of Earth.	Level 4 M1 L18–20, 25–27

ESS3 Earth and Human Activity	Aligned *PhD Science* Lessons
Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways.	Level 4 M1 L21–27
Some resources are renewable over time, and others are not.	Level 4 M1 L21–27
A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions).	Level 4 M1 L12–17, 25–27
Humans cannot eliminate the hazards but can take steps to reduce their impacts.	Level 4 M1 L12–17, 25–27
Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 4 M1 L12–17 Level 4 M4 L14–17

Engineering, Technology, and Applications of Science (ETS)

ETS1 Engineering Design	Aligned *PhD Science* Lessons
Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	Level 4 M2 L17–23
Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	Level 4 M4 L14–17
Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 4 M1 L12–17 Level 4 M4 L14–17

ETS2 Links Among Engineering, Technology, Science, and Society	Aligned *PhD Science* Lessons
Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.	Level 4 M1 L12–17 Level 4 M2 L15–16 Level 4 M4 L14–17

Crosscutting Concepts

Patterns	**Aligned *PhD Science* Lessons**
Similarities and differences in patterns can be used to sort and classify designed products.	Level 4 M3 L7–9, 30–31 Level 4 M4 L22–27
Patterns can be used as evidence to support an explanation.	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 L3–4, 7–8, 14–17

Cause and Effect	**Aligned *PhD Science* Lessons**
Cause and effect relationships are routinely identified, tested, and used to explain change.	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

Systems and System Models	**Aligned *PhD Science* Lessons**
A system can be described in terms of its components and their interactions.	Level 4 M1 L1–2, 12–17 Level 4 M2 L1–11, 24–26 Level 4 M3 L7–9, 15–19, 21–23, 26–28, 30–31 Level 4 M4 L1–6, 10–13, 18–27

Energy and Matter	**Aligned *PhD Science* Lessons**
Energy can be transferred in various ways and between objects.	Level 4 M2 L1–3, 8–26 Level 4 M3 L10–19, 30–31

Structure and Function	**Aligned *PhD Science* Lessons**
Substructures have shapes and parts that serve functions.	Level 4 M3 L4–6, 29–31

PhD Science® Correlation to the Oklahoma Academic Standards for Science (OAS-S): Level 5

The *PhD Science* Level 5 curriculum aligns fully with the Grade 5 OAS-S. A detailed analysis of alignment appears below.

Key: Module (M), Lesson (L)

Grade 5 Performance Expectations

Physical Science (PS)

Matter and Its Interactions (PS1)		**Aligned *PhD Science* Lessons**
5.PS1.1	Develop a model to describe that matter is made of particles too small to be seen.	Level 5 M1 L5–10, 23–26
5.PS1.2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	Level 5 M1 L9–17, 23–26
5.PS1.3	Make observations and measurements to identify materials based on their properties.	Level 5 M1 L1–4, 11–17, 23–26
5.PS1.4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	Level 5 M1 L1–2, 13–26

Motion and Stability: Forces and Interactions (PS2)		**Aligned *PhD Science* Lessons**
5.PS2.1	Support an argument, with evidence, that Earth's gravitational force pulls objects downward toward the center of the earth.	Level 5 M4 L3–4, 24–26

Energy (PS3)		**Aligned *PhD Science* Lessons**
5.PS3.1	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	Level 5 M2 L15–19, 24–26

Life Science (LS)

From Molecules to Organisms: Structure and Processes (LS1)		Aligned *PhD Science* Lessons
5.LS1.1	Support an argument that plants get the materials they need for growth chiefly from air and water.	Level 5 M2 L3–5, 24–26

Ecosystems: Interactions, Energy, and Dynamics (LS2)		Aligned *PhD Science* Lessons
5.LS2.1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	Level 5 M2 L1–2, 6–14, 20, 24–26
5.LS2.2	Use models to explain factors that upset the stability to local ecosystems.	Level 5 M2 L20–23

Earth and Space Science (ESS)

Earth's Place in the Universe (ESS1)		Aligned *PhD Science* Lessons
5.ESS1.1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	Level 5 M4 L18–19, 24–26
5.ESS1.2	Represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows, in addition to different positions of the sun, moon, and stars at different times of the day, month, and year.	Level 5 M4 L1–2, 5–17, 20–26

Earth's Systems (ESS2)		Aligned *PhD Science* Lessons
5-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
5-ESS2-2	Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	Level 5 M3 L4–5, 19–27

Earth and Human Activity (ESS3)		Aligned *PhD Science* Lessons
5.ESS3.1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environments.	Level 5 M3 L14–18, 24–27

Science and Engineering Practices

Developing and Using Models	**Aligned *PhD Science* Lessons**
Develop a model using an example to describe phenomena.	Level 5 M1 L1–2, 9–10, 13–14, 23–26 Level 5 M2 L1–2, 6–7, 14 Level 5 M3 L1–3, 9, 12–16, 25–27 Level 5 M4 L13, 20–26

Planning and Carrying Out Investigations	**Aligned *PhD Science* Lessons**
~~Plan and~~ Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	Level 5 M1 L18–22 Level 5 M2 L3–5 Level 5 M4 L25–26
Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	Level 5 M1 L13–14, 24–26 Level 5 M3 L10–11 Level 5 M4 L18–19

Analyzing and Interpreting Data	**Aligned *PhD Science* Lessons**
Represent data in graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.	Level 5 M2 L3–5, 10–11 Level 5 M3 L4–5, 14–16 Level 5 M4 L14–15

Using Mathematics and Computational Thinking	**Aligned *PhD Science* Lessons**
Describe and graph quantities such as area and volume to address scientific questions.	Level 5 M1 L3–4, 15–17 Level 5 M3 L10–11, 24–27

Engaging in Argument from Evidence	Aligned *PhD Science* Lessons
Construct and/or support an argument with evidence, data, and/or a model.	Level 5 M1 L3–4, 24–26 Level 5 M2 L3–5, 8–11, 25–26 Level 5 M3 L25–27 Level 5 M4 L13–17, 20–21, 24–26

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.	Level 5 M3 L9, 14–16, 19–27

Disciplinary Core Ideas

Physical Science

PS1 Matter and Its Interactions	Aligned *PhD Science* Lessons
Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means.	Level 5 M1 L5–10, 23–26
A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon, the effects of air on larger particles or objects.	Level 5 M1 L5–8, 23–26
The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.	Level 5 M1 L9–17, 23–26
No matter what reaction or change in properties occurs, the total weight of the substances does not change.	Level 5 M1 L9–17, 23–26
Measurements of a variety of properties can be used to identify materials.	Level 5 M1 L1–4, 11–17, 23–26
When two or more different substances are mixed, a new substance with different properties may be formed.	Level 5 M1 L1–2, 15–26

PS2 Motion and Stability: Forces and Interactions	Aligned *PhD Science* Lessons
The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	Level 5 M4 L3–4, 24–26

Physical Science (PS) and Life Science (LS)

PS3 Energy and LS1 From Molecules to Organisms: Structure and Processes	Aligned *PhD Science* Lessons
The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).	Level 5 M2 L6–7, 15–19, 24–26
Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.	Level 5 M2 L8–9, 15–19, 24–26

Life Science (LS)

LS2 Ecosystems: Interactions, Energy, and Dynamics	Aligned *PhD Science* Lessons
The food of almost any kind of animal can be traced back to plants.	Level 5 M2 L1–2, 8–14, 20, 24–26
Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.	Level 5 M2 L8–9
Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers."	Level 5 M2 L10–13
Decomposition eventually restores (recycles) some materials back to the soil.	Level 5 M2 L10–13
Organisms can survive only in environments in which their particular needs are met.	Level 5 M2 L8–9
A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life.	Level 5 M2 L14
Newly introduced species can damage the balance of an ecosystem.	Level 5 M2 L20–23
Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment and release waste matter (gas, liquid, or solid) back into the environment.	Level 5 M2 L6–7, 10–14, 24–26

Earth and Space Science (ESS)

ESS1 Earth's Place in the Universe	Aligned *PhD Science* Lessons
The sun is a star that appears brighter than other stars because it is closer to Earth.	Level 5 M4 L18–19, 24–26
The sun is a star that appears larger than other stars because it is closer to Earth.	Level 5 M4 L18–19, 24–26
Stars range greatly in their distance from Earth.	Level 5 M4 L18–19, 24–26
The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	Level 5 M4 L1–2, 5–17, 20–26

ESS2 Earth's Systems	Aligned *PhD Science* Lessons
Earth's major systems are the geosphere, hydrosphere, atmosphere, and biosphere. These systems interact in multiple ways to affect Earth's surface materials and processes.	Level 5 M3 L1–13, 24–27
The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate.	Level 5 M3 L4–13, 24–27
Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.	Level 5 M3 L6–9, 24–27
Nearly all of Earth's available water is in the ocean.	Level 5 M3 L4–5, 24–27
Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.	Level 5 M3 L4–5, 24–27

ESS3 Earth and Human Activity	Aligned *PhD Science* Lessons
Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.	Level 5 M3 L14–27

Crosscutting Concepts

Patterns	**Aligned *PhD Science* Lessons**
Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.	Level 5 M4 L5–6, 13–17, 22–23

Cause and Effect	**Aligned *PhD Science* Lessons**
Cause and effect relationships are routinely identified, tested, and used to explain change.	Level 5 M1 L1–2, 5–6, 9–10, 18–22, 24–26 Level 5 M2 L3–7, 12–13, 18–19, 21–23, 25–26 Level 5 M3 L6–8, 12–13, 17–18, 25–27 Level 5 M4 L5–6, 24–26

Scale, Proportion, and Quantity	**Aligned *PhD Science* Lessons**
Natural objects exist from the very small to the immensely large.	Level 5 M1 L23–26 Level 5 M2 L10–11 Level 5 M3 L4–5, 24–27 Level 5 M4 L18–19, 24–26
Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.	Level 5 M1 L3–4, 13–17, 23–26 Level 5 M3 L1–3, 10–11, 25–27

Systems and System Models	**Aligned *PhD Science* Lessons**
A system can be described in terms of its components and their interactions.	Level 5 M1 L3–4, 15–17 Level 5 M2 L1–2, 6–11, 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**
Matter is transported into, out of, and within systems.	Level 5 M2 L10–11, 25–26
Energy can be transferred in various ways and between objects.	Level 5 M1 L13–14 Level 5 M2 L15–19, 24–26 Level 5 M3 L10–11