Utah Science with Engineering Education (SEEd) Standards Correlation to *PhD Science*®

▦ Green indicates that *PhD Science*® fully addresses the standard within the grade level.

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Key: Module (M), Lesson (L)

PhD Science Level K

The Kindergarten Utah Science with Engineering Education (SEEd) Standards are covered by the Level K *PhD Science* curriculum; some standards are covered in a different grade level. A detailed analysis of alignment appears in the table below.

Kindergarten Strands and Standards

Strand K.1: Weather Patterns		
Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather to identify patterns over time. Weather scientists forecast severe weather so that communities can prepare for and respond to these events. Sunlight warms Earth's surface.		
Standards		**Aligned *PhD Science* Lessons**
K.1.1	**Obtain, evaluate, and communicate information** about local, observable weather conditions to describe <u>patterns</u> over time.	Level K M1 L1–11, 17–24, 28–30 Level K M4 L25
K.1.2	**Obtain, evaluate, and communicate information** on the effect of forecasted weather <u>patterns</u> on human behavior.	Level K M1 L17–20, 22–30
K.1.3	**Carry out an investigation** using the five senses to determine the <u>effect</u> of sunlight on different surfaces and materials.	Level K M1 L8–16, 28–30
K.1.4	**Design a solution** that will reduce the warming <u>effect</u> of sunlight on an area.	Level K M1 L8–16, 28–30

Strand K.2: Living Things and Their Surroundings		
Living things (plants and animals, including humans) depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. The characteristics of surroundings influence where living things are naturally found. Plants and animals affect and respond to their surroundings.		
Standards		**Aligned *PhD Science* Lessons**
K.2.1	**Obtain, evaluate, and communicate information** to describe <u>patterns</u> of what living things (plants and animals, including humans) need to survive.	Level K M3 L4–16, 19–22, 27–29
K.2.2	**Obtain, evaluate, and communicate information** about <u>patterns</u> in the relationships between the needs of different living things (plants and 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.2.3	**Obtain, evaluate, and communicate information** about how living things (plants and animals, including humans) <u>affect</u> their surroundings to survive.	Level K M3 L4–16, 19–22, 27–29
K.2.4	**Design and communicate a solution** to address the <u>effects</u> that living things (plants and animals, including humans) experience while trying to survive in their surroundings.	Level K M3 L1–3, 9–29 Level K M4 L1–5, 8–9, 11–16
Strand K.3: Forces, Motion, and Interactions		**Aligned *PhD Science* Lessons**
The motion of objects can be observed and described. Pushing or pulling on an object can change the speed or direction of an object's motion and can start or stop it. Pushes and pulls can have different strengths and different directions. A bigger push or pull makes things go faster and when objects touch or collide, they push on one another and can change motion.		
Standards		**Aligned *PhD Science* Lessons**
K.3.1	**Plan and conduct an investigation** to compare the <u>effects</u> of different strengths or different directions of forces on the motion of an object.	Level K M2 L7–23
K.3.2	**Analyze data** to determine how a **design solution** <u>causes</u> a change in the speed or direction of an object with a push or a pull.	Level K M2 L1–23

Science and Engineering Practices		
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
• Plan and conduct an investigation 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 Level 2 M2 L8–12 Level 2 M3 L3–7 Level 2 M4 L17–19
• Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.		Level K M4 L3–5
• Make observations (firsthand or from media) and/or measurements 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
• Make predictions based on prior experiences.		Level K M2 L13–15 Level K M3 L4–8
Analyzing and Interpreting Data		**Aligned *PhD Science* Lessons**
• Record information (observations, thoughts, and ideas).		Level K M1 L4–7, 22–24 Level K M2 L4–6, 21–23 Level K M3 L1–3, 9–16 Level K M4 L14–16
• Use and share pictures, drawings, and/or writings of observations.		Level K M2 L7–8 Level K M4 L1–2, 6–7, 10, 14–17, 20–24, 26–28
• Use observations (firsthand or from media) to describe patterns and/or relationships in the natural world in order to answer scientific questions.		Level K M3 L4–8, 14–20, 22–26 Level K M4 L25
• Compare predictions (based on prior experiences) to what occurred (observable events).		Level K M4 L14–16
Constructing Explanations and Designing Solutions		**Aligned *PhD Science* Lessons**
• Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.		Level K M2 L17–20
• Generate and/or compare multiple solutions to a problem.		Level 1 M3 L21–25 Level 2 M2 L8–12, 14–17

Obtaining, Evaluating, and Communicating Information		Aligned *PhD Science* Lessons
• Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural world.		Level K M4 L1–2, 6–10, 14–16, 18–19
• Describe how specific images support a scientific idea.		Level 1 M4 L14–18, 23–25 Level 2 M3 L14–18
• Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.		Level K M3 L23–26
• Communicate information with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas and/or practices.		Level K M1 L12–16, 28–30 Level K M2 L21–23 Level K M3 L27–29 Level K M4 L20–24, 26–28

Disciplinary Core Ideas			
PS2.A	Forces and Motion		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
PS2.B	Types of Interactions		Aligned *PhD Science* Lessons
	When objects touch or collide, they push on one another and can change motion.		Level K M2 L13–23
PS2.C	Stability and Instability in Physical Systems		Aligned *PhD Science* Lessons
	Whether an object stays still or moves often depends on the effects of multiple pushes and pulls on it.		Level 3 M4 L1–9, 28–30
	It is useful to investigate what pushes and pulls keep something in place (e.g., a ball on a slope, a ladder leaning on a wall) as well as what makes something change or move.		Level K M2 L10–12, 13–15
PS3.B	Conservation of Energy and Energy Transfer		Aligned *PhD Science* Lessons
	Sunlight warms Earth's surface.		Level K M1 L8–16, 28–30
PS3.C	Relationship Between Energy and Forces		Aligned *PhD Science* Lessons
	A bigger push or pull makes things speed up or slow down more quickly.		Level K M2 L7–9, 21–23

LS1.C	Organization for Matter and Energy Flow in Organisms		Aligned *PhD Science* Lessons
	All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.		Level K M3 L4–16, 19–20, 22, 27–29
LS2.A	Interdependent Relationships in Ecosystems		Aligned *PhD Science* Lessons
	Animals depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. Animals depend on plants or other animals for food. Plants depend on air, water, minerals (in the soil), and light to grow. Different plants survive better in different settings because they have varied needs for water, minerals, and sunlight.		Level K M3 L4–16, 19–20, L22, L27–29
LS2.B	Cycles of Matter and Energy Transfer in Ecosystems		Aligned *PhD Science* Lessons
	Organisms obtain the materials they need to grow and survive from the environment. Many of these materials come from organisms and are used again by other organisms.		Level 5 M2 L6–7, 10–14, 24–26
ESS2.D	Weather and Climate		Aligned *PhD Science* Lessons
	Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. 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
ESS2.E	Biogeology		Aligned *PhD Science* Lessons
	Plants and animals can change their environment.		Level K M4 L1–10, 14–16, 26–28
ESS3.A	Natural Resources		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. Humans use natural resources for everything they do.		Level K M3 L1–3, 9–29 Level K M4 L1–5, 8–9, 11–16
ESS3.B	Natural Hazards		Aligned *PhD Science* Lessons
	Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast typical and severe weather so that the communities can prepare for and respond to these events.		Level K M1 L17–20, 22–30
ESS3.C	Human Impacts on Earth Systems		Aligned *PhD Science* Lessons
	Plants and animals have an effect on their surroundings.		Level K M4 L1–10, 14–16, 26–28
ETS1.A	Defining and Delimiting Engineering Problems		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

	Asking questions, making observations, and gathering information are helpful in thinking about problems.		Level K M1 L12–16
	Before beginning to design a solution, it is important to clearly understand the problem.		Level K M1 L12–16
ETS1.B	**Developing Possible Solutions**		**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 K M2 L17–20 Level K M4 L20–24
ETS1.C	**Optimizing the Design Solution**		**Aligned *PhD Science* Lessons**
	Because there is always more than one possible solution to a problem, it is useful to compare and test designs.		Level K M4 L20–24

Crosscutting Concepts		
Patterns		**Aligned *PhD Science* Lessons**
• Patterns in the natural 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
• Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.		Level K M1 L17–26 Level K M3 L14–18, 22 Level K M4 L3–5
Cause and Effect		**Aligned *PhD Science* Lessons**
• Events have causes that generate observable patterns.		Level K M2 L4–16, 21–23 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

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Key: Module (M), Lesson (L)

PhD Science Level 1

The Grade 1 Utah Science with Engineering Education (SEEd) Standards are covered by the Level 1 *PhD Science* curriculum; some standards are covered in a different grade level. A detailed analysis of alignment appears in the table below.

Grade 1 Strands and Standards

Strand 1.1: Seasons and Space Patterns		
Seasonal patterns of motion of the Sun, Moon, and stars can be observed, described, and predicted. These patterns may vary depending on the region, location, or time of year.		
Standards		**Aligned *PhD Science* Lessons**
1.1.1	**Obtain, evaluate, and communicate information** about the movement of the Sun, Moon, and stars to describe predictable <u>patterns</u>.	Level 1 M4 L1–8, 14–25
1.1.2	**Obtain, evaluate, and communicate information** about the <u>patterns</u> observed at different times of the year to relate the amount of daylight to the time of year.	Level 1 M4 L9–13, 23–25
1.1.3	**Design** a device that measures the varying <u>patterns</u> of daylight.	

Strand 1.2: The Needs of Living Things and Their Offspring		
Living things (plants and animals, including humans) depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. Plants and animals have external features that allow them to survive in a variety of environments. Young plants and animals are similar but not exactly like their parents. In many kinds of animals, parents and offspring engage in behaviors that help the offspring to survive.		
Standards		**Aligned *PhD Science* Lessons**
1.2.1	**Plan and carry out an investigation** to determine the effect of sunlight and water on plant growth.	Level 2 M3 L1–7, 25–29
1.2.2	**Construct an explanation** by observing patterns of external features of living things that survive in different locations.	Level 2 M4 L1–3, 7–25
1.2.3	**Obtain, evaluate, and communicate information** about the patterns of plants and nonhuman animals that are like, but not exactly like, their parents.	Level 1 M1 L22–23, 26–29
1.2.4	**Construct an explanation** of the patterns in the behaviors of parents and offspring which help offspring to survive.	Level 1 M1 L24–29
Strand 1.3: Light and Sound		**Aligned *PhD Science* Lessons**
Sound can make matter vibrate, and vibrating matter can make sound. Objects can only be seen when light is available to illuminate them. Some objects give off their own light. Some materials allow light to pass through them, others allow only some light to pass through them, and still others block light and create a dark shadow on the surface beyond them where the light cannot reach. Mirrors can be used to redirect light. People use a variety of devices that may include sound and light to communicate over long distances.		
Standards		**Aligned *PhD Science* Lessons**
1.3.1	**Plan and carry out an investigation** to show the cause and effect relationship between sound and vibrating matter.	Level 1 M3 L1–17, 26–29
1.3.2	**Use a model** to show the effect of light on objects.	Level 1 M2 L1–9, 21–23
1.3.3	**Plan and carry out an investigation** to determine the effect of materials in the path of a beam of light.	Level 1 M2 L1–3, 10–23
1.3.4	**Design a device** in which the structure of the device uses light or sound to solve the problem of communicating over a distance.	Level 1 M3 L18–29

Science and Engineering Practices		
Developing and Using Models		**Aligned *PhD Science* Lessons**
• Distinguish between a model and the actual object, process, and/or events the model represents.		Level 1 M1 L4–9, 18 Level 1 M3 L14
• Compare models to identify common features and differences.		Level 1 M1 L11–15 Level 1 M2 L1–3
• Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).		Level 1 M1 L1–8 Level 1 M2 L1–7, 10–23 Level 1 M3 L7, 11–13 Level 1 M4 L1–3, 7–8
• Develop a simple model based on evidence to represent a proposed object or tool.		Level 1 M1 L11–15
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 1 M1 L19–20 Level 1 M2 L15–18
• Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.		Level K M4 L3–5 Level 2 M2 L3–4, 8–12, 22–24
• Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.		Level 1 M2 L4–12, 15–18, 20–23 Level 1 M3 L1–7, 11–13, 18–19 Level 1 M4 L4–6, 14–16, 19–21
• Make predictions based on prior experiences.		Level 1 M3 L11–13, 15–17, 26–29 Level 1 M4 L1–3
Constructing Explanations and Designing Solutions		**Aligned *PhD Science* Lessons**
• Use information from observations (firsthand or from media) to construct an evidence-based account about how external features of living things help them to survive in different locations.		Level 1 M1 L1–9, 16–21, 27–29
• Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.		Level 1 M1 L11–15
• Generate and/or compare multiple solutions to a problem.		Level 1 M3 L21–25

Obtaining, Evaluating, and Communicating Information		Aligned *PhD Science* Lessons
•	Read grade-appropriate texts and/or use media to obtain scientific information to determine patterns in and/or evidence about the natural world.	Level 1 M1 L24–25 Level 1 M3 L18–19 Level 1 M4 L9–13
•	Describe how specific images support a scientific idea.	Level 1 M4 L14–18, 23–25
•	Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.	Level K M3 L23–26 Level 2 M2 L5–6, 18–19 Level 2 M4 L4–9, 11–16, 23–25
•	Communicate information with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas and/or practices.	Level 1 M1 L27–29 Level 1 M2 L21–23 Level 1 M3 L26–29 Level 1 M4 L23–25

Disciplinary Core Ideas		
PS4.A	**Wave Properties**	Aligned *PhD Science* Lessons
	Sound can make matter vibrate, and vibrating matter can make sound.	Level 1 M3 L1–17, 26–29
PS4.B	**Electromagnetic Radiation**	Aligned *PhD Science* Lessons
	Objects can be seen when light is available to illuminate them. Some objects 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
PS4.C	**Information Technologies and Instrumentation**	Aligned *PhD Science* Lessons
	People use their senses to learn about the world around them. Their eyes detect light, their ears detect sound, and they can feel vibrations by touch.	Level 1 M2 L1–12, 15–17, 19–23 Level 1 M3 L1–17, 26–29 Level 1 M4 L1–8, 14–25
	People also use a variety of devices to communicate (send and receive information) over long distances.	Level 1 M3 L18–29

LS1.A	Structure and Function		Aligned *PhD Science* Lessons
	The external features of living things, found in specific surroundings, share similar physical characteristics.		Level 1 M1 L1–9, 16–21, 27–29
LS1.B	Growth and Development of Organisms		Aligned *PhD Science* Lessons
	In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.		Level 1 M1 L24–29
LS1.C	Organization for Matter and Energy Flow in Organisms		Aligned *PhD Science* Lessons
	Plants need water and light to live and grow.		Level K M3 L4–16, 19–20, 22, 27–29
LS1.D	Information Processing		Aligned *PhD Science* Lessons
	Living things have external parts that are used to help them survive in specific surroundings.		Level 1 M1 L1–9, 16–21, 27–29
LS2.A	Interdependent Relationships in Ecosystems		Aligned *PhD Science* Lessons
	Plants depend on air, water, minerals (in the soil), and light to grow. Different plants survive better in different settings because they have varied needs of water, minerals, and sunlight.		Level 2 M3 L1–7, 25–29
LS3.A	Inheritance of Traits		Aligned *PhD Science* Lessons
	Plants and young animals are very much, but not exactly, like their parents and also look similar to other plants and/or animals of the same kind.		Level 1 M1 L22–23, 26–29
LS3.B	Variation of Traits		Aligned *PhD Science* Lessons
	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
ESS1.A	The Universe and Its Stars		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
	At night one can see the light coming from many stars.		Level 1 M4 L1–3, 14–25
ESS1.B	Earth and The Solar System		Aligned *PhD Science* Lessons
	Seasonal patterns of sunrise and sunset can be observed, described, and predicted.		Level 1 M4 L9–13, 23–25

ETS1.A	Defining and Delimiting Engineering Problems		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 1 M1 L11–15
	Asking questions, making observations, and gathering information are helpful in thinking about problems.		Level 1 M1 L11–15
	Before beginning to design a solution, it is important to clearly understand the problem.		Level 1 M1 L11–15
ETS1.B	Developing Possible Solutions		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
ETS1.C	Optimizing the Design Solution		Aligned *PhD Science* Lessons
	Because there is always more than one possible solution to a problem, it is useful to compare and test designs.		Level 1 M3 L21–25

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 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
• External features of plants and nonhuman animals, found in specific surroundings, share similar physical characteristics.		Level 1 M1 L1–9, 16–21, 27–29
• Plants and nonhuman animals are like, but not exactly like, their parents.		Level 1 M1 L22–23, 26–29
• Parents and offspring demonstrate behaviors which help offspring to survive.		Level 1 M1 L24–29

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 function(s).		Level 1 M1 L4–15, 27–29
		Level 1 M3 L8–9

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PhD Science Level 2

The Grade 2 Utah Science with Engineering Education (SEEd) Standards are covered by the Level 2 *PhD Science* curriculum; some standards are covered in a different grade level. A detailed analysis of alignment appears in the table below.

Grade 2 Strands and Standards

Strand 2.1: Changes in the Earth's Surface			
Earth has an ancient history of slow and gradual surface changes, punctuated with quick but powerful geologic events like volcanic eruptions, flooding, and earthquakes. Water and wind play a significant role in changing Earth's surface. The effects of wind and water can cause both slow and quick changes to the surface of the Earth. Scientists and engineers design solutions to slow or prevent wind or water from changing the land.			
Standards			**Aligned *PhD Science* Lessons**
2.1.1	**Develop and use models** illustrating the <u>patterns</u> of landforms and water on Earth.		Level 2 M2 L1–2, 5–6 Level 2 M4 L1–6, 11–16, 20–21, 23–25
2.1.2	**Construct an explanation** about <u>changes</u> in Earth's surface that happen quickly or slowly.		Level 2 M2 L18–24
2.1.3	**Design solutions** to slow or prevent wind or water from <u>changing</u> the shape of land.		Level 2 M2 L1–17, 20, 22–24

Strand 2.2: Living Things and Their Habitats		
Living things (plants and animals, including humans) need water, air, and resources from the land to survive and live in habitats that provide these necessities. The physical characteristics of plants and animals reflect the habitat in which they live. Animals also have modified behaviors that help them survive, grow, and meet their needs. Humans sometimes mimic plant and animal adaptations to survive in their environment.		
Standards		**Aligned *PhD Science* Lessons**
2.2.1	**Obtain, evaluate, and communicate information** about <u>patterns</u> of living things (plants and animals, including humans) in different habitats.	Level 2 M4 L1–3, 7–25
2.2.2	**Plan and carry out an investigation** of the <u>structure and function</u> of plant and animal parts in different habitats.	Level 2 M4 L1–3, 7–25
2.2.3	**Develop and use a model** that mimics the <u>function</u> of an animal dispersing seeds or pollinating plants.	Level 2 M3 L8–29
2.2.4	**Design a solution** to a human problem by mimicking the <u>structure and function</u> of plants and/or animals and how they use their external parts to help them survive, grow, and meet their needs.	Level 1 M1 L1–21, 27–29
Strand 2.3: Properties of Matter		
All things are made of matter which exists with different forms and properties. Matter can be described and classified by its observable properties. Materials with certain properties are well-suited for specific uses. Heating or cooling some types of matter may or may not irreversibly change their properties.		
Standards		**Aligned *PhD Science* Lessons**
2.3.1	**Plan and carry out an investigation** to classify different kinds of materials based on <u>patterns</u> in their observable properties.	Level 2 M1 L1–9, 12–16, 19, 23, 29–31 Level 2 M2 L3–4, 14–17
2.3.2	**Construct an explanation** showing how the properties of materials influence their intended use and <u>function</u>.	Level 2 M1 L20–31
2.3.3	**Develop and use a model** to describe how an object, made of a small set of pieces, can be disassembled and reshaped into a new object with a different <u>function</u>.	Level 2 M1 L10–11, 29–31
2.3.4	**Obtain, evaluate, and communicate information** about changes in matter <u>caused</u> by heating or cooling.	Level 2 M1 L14–19, 29–31

Science and Engineering Practices		
Developing and Using Models		**Aligned *PhD Science* Lessons**
• Distinguish between a model and the actual object, process, and/or events the model represents.		Level 2 M4 L4–6
• Compare models to identify common features and differences.		Level 2 M4 L1–6, 20–21, 23–25
• Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).		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
• Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.		Level 2 M2 L3–4, 8–12, 22–24
• Make observations (firsthand or from media) and/or measurements 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
• Make predictions based on prior experiences.		Level 2 M1 L17–18
Constructing Explanations and Designing Solutions		**Aligned *PhD Science* Lessons**
• Use information from 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
• Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.		Level 2 M1 L24–28
• Generate and/or compare multiple solutions to a problem.		Level 2 M2 L8–12, 14–17

Obtaining, Evaluating, and Communicating Information	Aligned *PhD Science* Lessons
• Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural world.	Level 2 M2 L1–2, 14–17
• Describe how specific images (a diagram showing how a machine works, video of burning wood) support a scientific idea.	Level 2 M3 L14–18
• Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.	Level 2 M2 L5–6, 18–19 Level 2 M4 L4–9, 11–16, 23–25
• Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.	Level 2 M1 L29–31 Level 2 M2 L22–24 Level 2 M3 L8–12, 14–20, 25–29 Level 2 M4 L23–25

Disciplinary Core Ideas		
PS1.A	**Structure and Properties of Matter**	**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 L1–3, 10–16, 29–31
	Matter can be described and classified by its observable properties.	Level 2 M1 L4–9, 12–16, 23, 29–31 Level 2 M2 L3–4, 14–17
PS1.B	**Chemical Reactions**	**Aligned *PhD Science* Lessons**
	Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.	Level 2 M1 L14–19, 29–31
LS1.A	**Structure and Function**	**Aligned *PhD Science* Lessons**
	All organisms have external parts. 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. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive, grow, and produce more plants.	Level 1 M1 L1–15, 27–29

LS1.D	Information Processing		Aligned *PhD Science* Lessons
	Animals have body parts that capture and convey different kinds of information needed for growth and survival—for example, eyes for lights, ears for sounds, and skin for temperature or touch. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.		Level 1 M1 L16–21, 27–29
LS2.A	Interdependent Relationships in Ecosystems		Aligned *PhD Science* Lessons
	Plants cannot move around and often depend on animals for pollination or to move their seeds around.		Level 2 M3 L8–22
LS2.C	Ecosystem Dynamics, Functioning, and Resilience		Aligned *PhD Science* Lessons
	The places where plants and animals live often change, and when animals and plants get too hot they may die.		Level 3 M2 L16–28
LS4.A	Evidence of Common Ancestry and Diversity		Aligned *PhD Science* Lessons
	Some kinds of plants and animals that once lived on Earth (e.g., dinosaurs) are no longer found anywhere, although others now living (e.g., lizards) resemble them in some ways.		Level 3 M2 L1–2, 9–12, 16–19, 22–28
LS4.C	Adaptation		Aligned *PhD Science* Lessons
	Living things can survive only where their needs are met and the environment in which they live meets those needs.		Level 2 M4 L1–3, 7–10, 11–25
LS4.D	Biodiversity and Humans		Aligned *PhD Science* Lessons
	There are many different kinds of living things in any area, and they live exist in different places on land and in water.		Level 2 M4 L1–3, 7–25

ESS1.C	The History of Planet Earth		Aligned *PhD Science* Lessons
	Some events happen very quickly; others, such as the formation of the Grand Canyon, occur very slowly over a time period much longer than one can observe.		Level 2 M2 L18–24
ESS2.A	Earth Materials and Systems		Aligned *PhD Science* Lessons
	Wind and water can change the shape of the land.		Level 2 M2 L1–17, 20, 22–24
ESS2.B	Plate Tectonics and Large-Scale System Interactions		Aligned *PhD Science* Lessons
	Maps show where things are located. 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
ESS2.C	The Roles of Water in Earth's Surface Processes		Aligned *PhD Science* Lessons
	Water is found in the oceans, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.		Level 2 M4 L1–6, 16, 22–25
ETS1.A	Defining and Delimiting Engineering Problems		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 2 M1 L24–28 Level 2 M2 L8–12
	Asking questions, making observations, and gathering information are helpful in thinking about problems.		Level 2 M1 L24–28
	Before beginning to design a solution, it is important to clearly understand the problem.		Level 2 M1 L24–28
ETS1.B	Developing Possible Solutions		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
ETS1.C	Optimizing the Design Solution		Aligned *PhD Science* Lessons
	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

Crosscutting Concepts		
Patterns		**Aligned *PhD Science* Lessons**
• Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.		Level 2 M1 L4–9 Level 2 M2 L1–2, 5–6 Level 2 M4 L1–8, 11–15, 20–21, 23–25
• Living things are found in diverse environments dependent on the ability to have their needs met in that habitat.		Level 2 M4 L1–3, 7–25
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
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**
• Some things stay the same while other things change.		Level 2 M2 L1–2, 22–24 Level 2 M3 L1–2, 25–29
• Things may change slowly or rapidly.		Level 2 M2 L18–24