



## Oregon 2014 Science Standards (NGSS) Correlation to *PhD Science*®

 Green indicates that *PhD Science*® fully addresses the standard within the grade level or the K–2 grade band.

 Blue indicates that *PhD Science* covers the standard but in a different grade band.

 Yellow indicates that *PhD Science* partially covers the standard within the grade level or grade band.

 Red indicates that *PhD Science* does not cover the standard.

**Key:** Module (M), Lesson (L)

### *PhD Science* Level K

The Kindergarten Oregon 2014 Science Standards (NGSS) are fully covered by the *PhD Science* K–2 curriculum. A detailed analysis of alignment appears in the table below. The lessons listed address the full and partial language of the specified NGSS component.

Grade K Performance Expectations		
<b>K-LS1 From Molecules to Organisms: Structures and Processes</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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
<b>K-ESS2 Earth’s Systems</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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

<b>K-ESS3 Earth and Human Activity</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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 obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.	Level K M1 L22–30
K-ESS3-3	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
<b>K-PS2 Motion and Stability: Forces and Interactions</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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 a pull.	Level K M2 L17–23
<b>K-PS3 Energy</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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
<b>K–2-ETS1 Engineering Design</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
K–2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	Level K M1 L12–16
K–2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	Level K M2 L17–20
K–2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	Level K M4 L20–24

Science and Engineering Practices		
<b>1</b>	<b>Asking Questions and Defining Problems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Ask questions based on observations to find more information about the natural and/or designed world(s).</li> </ul>	Level K M1 L1–3, 22–26 Level K M2 L1–3, 9 Level K M3 L1–3, 14–16, 27–29
	<ul style="list-style-type: none"> <li>Ask and/or identify questions that can be answered by an investigation.</li> </ul>	Level K M1 L8–9 Level K M3 L4–8, 22
	<ul style="list-style-type: none"> <li>Define a simple problem that can be solved through the development of a new or improved object or tool.</li> </ul>	Level K M1 L4–7, 12–16
<b>2</b>	<b>Developing and Using Models</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Distinguish between a model and the actual object, process, and/or events the model represents.</li> </ul>	Level K M1 L1–2, 12–16 Level K M2 L1–3, 10–12
	<ul style="list-style-type: none"> <li>Compare models to identify common features and differences.</li> </ul>	Level 1 M1 L11–15 Level 1 M2 L1–3 Level 2 M4 L1–6, 20–21, 23–25
	<ul style="list-style-type: none"> <li>Use a model to represent relationships in the natural and designed world(s).</li> </ul>	Level K M3 L1–3, 9–12, 19–20 Level K M4 L1–9, 11–16
	<ul style="list-style-type: none"> <li>Develop a simple model based on evidence to represent a proposed object or tool.</li> </ul>	Level K M1 L12–16

3	<b>Planning and Carrying Out Investigations</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>With guidance, plan and conduct an investigation in collaboration with peers.</li> </ul>	Level K M2 L7–8, 10–15 Level K M3 L4–8
	<ul style="list-style-type: none"> <li>Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</li> </ul>	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
	<ul style="list-style-type: none"> <li>Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.</li> </ul>	Level K M4 L3–5
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) to collect data that can be used to make comparisons.</li> </ul>	Level K M1 L4–7, 10–11, 17–24, 27–30 Level K M2 L7–8, 16–23 Level K M3 L21
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.</li> </ul>	Level K M1 L4–7, 12–20 Level K M2 L17–20
	<ul style="list-style-type: none"> <li>Make predictions based on prior experiences.</li> </ul>	Level K M2 L13–15 Level K M3 L4–8
4	<b>Analyzing and Interpreting Data</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Record information (observations, thoughts, and ideas).</li> </ul>	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
	<ul style="list-style-type: none"> <li>Use and share pictures, drawings, and/or writings of observations.</li> </ul>	Level K M2 L7–8 Level K M4 L1–2, 6–7, 10, 14–17, 20–24, 26–28
	<ul style="list-style-type: none"> <li>Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.</li> </ul>	Level K M3 L4–8, 14–20, 22–26 Level K M4 L25
	<ul style="list-style-type: none"> <li>Compare predictions (based on prior experiences) to what occurred (observable events).</li> </ul>	Level K M4 L14–16
	<ul style="list-style-type: none"> <li>Analyze data from tests of an object or tool to determine if it works as intended.</li> </ul>	Level K M4 L20–24

5	<b>Using Mathematics and Computational Thinking</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Decide when to use qualitative vs. quantitative data.</li> </ul>	Level K M2 L17–20
	<ul style="list-style-type: none"> <li>Use counting and numbers to identify and describe patterns in the natural and designed world(s).</li> </ul>	Level K M1 L17–21, 25–30 Level K M2 L17–20
	<ul style="list-style-type: none"> <li>Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.</li> </ul>	Level 2 M1 L20–22 Level 2 M3 L8–11, 23–29 Level 2 M4 L17–19
	<ul style="list-style-type: none"> <li>Use quantitative data to compare two alternative solutions to a problem.</li> </ul>	Level 1 M3 L21–25 Level 2 M2 L14–17
6	<b>Constructing Explanations and Designing Solutions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul>	Level K M3 L4–16, 23–29
	<ul style="list-style-type: none"> <li>Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.</li> </ul>	Level K M2 L17–20
	<ul style="list-style-type: none"> <li>Generate and/or compare multiple solutions to a problem.</li> </ul>	Level 1 M3 L21–25 Level 2 M2 L8–12, 14–17
7	<b>Engaging in Argument from Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Identify arguments that are supported by evidence.</li> </ul>	Level K M3 L17–18
	<ul style="list-style-type: none"> <li>Distinguish between explanations that account for all gathered evidence and those that do not.</li> </ul>	Level 1 M3 L4–6 Level 1 M4 L14–18
	<ul style="list-style-type: none"> <li>Analyze why some evidence is relevant to a scientific question and some is not.</li> </ul>	Level K M4 L25
	<ul style="list-style-type: none"> <li>Distinguish between opinions and evidence in one’s own explanations.</li> </ul>	Level K M3 L17–18
	<ul style="list-style-type: none"> <li>Listen actively to arguments to indicate agreement or disagreement based on evidence and/or to retell the main points of the argument.</li> </ul>	Level K M3 L17–20 Level K M4 L3–5, 11–13
	<ul style="list-style-type: none"> <li>Construct an argument with evidence to support a claim.</li> </ul>	Level K M3 L17–21, 27–29
	<ul style="list-style-type: none"> <li>Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.</li> </ul>	Level 1 M3 L8–9, 18–20 Level 2 M3 L14–18, 21–22

<b>8</b>	<b>Obtaining, Evaluating, and Communicating Information</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world.</li> </ul>	Level K M4 L1–2, 6–10, 14–16, 18–19
	<ul style="list-style-type: none"> <li>Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.</li> </ul>	Level 1 M4 L14–18, 23–25 Level 2 M3 L14–18
	<ul style="list-style-type: none"> <li>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.</li> </ul>	Level K M3 L23–26
	<ul style="list-style-type: none"> <li>Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.</li> </ul>	Level K M1 L12–16, 28–30 Level K M2 L21–23 Level K M3 L27–29 Level K M4 L20–24, 26–28

<b>Disciplinary Core Ideas</b>		
<b>PS2.A</b>	<b>Forces and Motion</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>PS2.B</b>	<b>Types of Interactions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	When objects touch or collide, they push on one another and can change motion.	Level K M2 L13–23
<b>PS3.B</b>	<b>Conservation of Energy and Energy Transfer</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Sunlight warms Earth’s surface.	Level K M1 L8–16, 28–30
<b>PS3.C</b>	<b>Relationship Between Energy and Forces</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	A bigger push or pull makes things go faster.	Level K M2 L7–9, 21–23
<b>LS1.C</b>	<b>Organization for Matter and Energy Flow in Organisms</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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

<b>ESS2.D</b>	<b>Weather and Climate</b>	<b>Aligned PhD Science Lessons</b>
	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
<b>ESS2.E</b>	<b>Biogeology</b>	<b>Aligned PhD Science Lessons</b>
	Plants and animals can change their environment.	Level K M4 L1–10, 14–16, 26–28
<b>ESS3.A</b>	<b>Natural Resources</b>	<b>Aligned PhD Science Lessons</b>
	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
<b>ESS3.B</b>	<b>Natural Hazards</b>	<b>Aligned PhD Science Lessons</b>
	Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.	Level K M1 L17–20, 22–30
<b>ESS3.C</b>	<b>Human Impacts on Earth Systems</b>	<b>Aligned PhD Science Lessons</b>
	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

<b>ETS1.A</b>	<b>Defining and Delimiting Engineering Problems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ETS1.B</b>	<b>Developing Possible Solutions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ETS1.C</b>	<b>Optimizing the Design Solution</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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

<b>Crosscutting Concepts</b>		
<b>1</b>	<b>Patterns</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</li> </ul>	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
<b>2</b>	<b>Cause and Effect</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Events have causes that generate observable patterns.</li> </ul>	Level K M2 L4–16, 21–23 Level K M4 L3–5, 10, 14–19, 26–28
	<ul style="list-style-type: none"> <li>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> </ul>	Level K M2 L10–12, 17–20





<b>3</b>	<b>Scale, Proportion, and Quantity</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Relative scales allow objects and events to be compared and described (e.g., bigger and smaller, hotter and colder, faster and slower).</li> </ul>	Level K M1 L1–7, 10–24, 28–30 Level K M2 L7–9, 13–15, 21–23 Level K M3 L1–3 Level K M4 L25
	<ul style="list-style-type: none"> <li>Standard units are used to measure length.</li> </ul>	Level 2 M3 L3–6, 14–18, 25–29
<b>4</b>	<b>Systems and System Models</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Objects and organisms can be described in terms of their parts.</li> </ul>	Level 1 M1 L1–6, 16–17 Level 1 M3 L1–3, 8–10, 14, 21–29 Level 2 M1 L1–7, 12–13, 20–23, 29–31 Level 2 M2 L3–4, 7 Level 2 M3 L8–13, 19–24
	<ul style="list-style-type: none"> <li>Systems in the natural and designed world have parts that work together.</li> </ul>	Level K M3 L1–3, 9–13, 19–21, 23–25, 27–29 Level K M4 L1–9, 11–16
<b>5</b>	<b>Energy and Matter</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Objects may break into smaller pieces, be put together into larger pieces, or change shapes.</li> </ul>	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24
<b>6</b>	<b>Structure and Function</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>The shape and stability of structures of natural and designed objects are related to their function(s).</li> </ul>	Level K M1 L10–16 Level K M4 L20–24
<b>7</b>	<b>Stability and Change</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Some things stay the same while other things change.</li> </ul>	Level K M1 L8–9, 17–21
	<ul style="list-style-type: none"> <li>Things may change slowly or rapidly.</li> </ul>	Level K M4 L14–16

<b>Connections to Nature of Science</b>	
<b>Scientific Investigations Use a Variety of Methods</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science investigations begin with a question.</li> </ul>	Level K M1 L8–9 Level K M4 L20–24
<ul style="list-style-type: none"> <li>Scientists use different ways to study the world.</li> </ul>	Level K M2 L16
<b>Scientific Knowledge Is Based on Empirical Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Scientists look for patterns and order when making observations about the world.</li> </ul>	Level K M3 L4–8, 14–16
<b>Scientific Knowledge Is Open to Revision in Light of New Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science knowledge can change when new information is found.</li> </ul>	Level 1 M3 L15–16 Level 2 M4 L4–6
<b>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Scientists use drawings, sketches, and models as a way to communicate ideas.</li> </ul>	Level K M4 L1–2
<ul style="list-style-type: none"> <li>Scientists search for cause and effect relationships to explain natural events.</li> </ul>	Level 1 M2 L10–12 Level 2 M2 L10–12
<b>Science Is a Way of Knowing</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science knowledge help us know about the world.</li> </ul>	Level K M2 L4–6, 9 Level K M4 L25
<b>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science assumes natural events happen today as they happened in the past.</li> </ul>	Level K M1 L21
<ul style="list-style-type: none"> <li>Many events are repeated.</li> </ul>	Level K M1 L17–20
<b>Science Is a Human Endeavor</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>People have practiced science for a long time.</li> </ul>	Level K M3 L14–16
<ul style="list-style-type: none"> <li>Men and women of diverse backgrounds are scientists and engineers.</li> </ul>	Level K M3 L14–16
<b>Science Addresses Questions About the Natural and Material World</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Scientists study the natural and material world.</li> </ul>	Level K M1 L1–2, 12–16, 28–30 Level K M2 L21–23 Level K M3 L27–29 Level K M4 L26–28

<b>Connections to Engineering, Technology, and Applications of Science</b>	
<b>Interdependence of Science, Engineering, and Technology</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science and engineering involve the use of tools to observe and measure things.</li> </ul>	Level 2 M3 L3–6, 14–18
<ul style="list-style-type: none"> <li>People encounter questions about the natural world every day.</li> </ul>	Level K M3 L1–3 Level K M4 L25
<b>Influence of Engineering, Technology, and Science on Society and the Natural World</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials.</li> </ul>	Level 1 M1 L10–15 Level 2 M2 L14–17 Level 2 M3 L14–18
<ul style="list-style-type: none"> <li>Taking natural materials to make things impacts the environment.</li> </ul>	Level K M4 L11–13
<ul style="list-style-type: none"> <li>People depend on various technologies in their lives; human life would be very different without technology.</li> </ul>	Level K M4 L18–19

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**Key:** Module (M), Lesson(L)

### *PhD Science* Level 1

The Grade 1 Oregon 2014 Science Standards(NGSS) are fully covered by the *PhD Science* K–2 curriculum. A detailed analysis of alignment appears in the table below. The lessons listed address the full and partial language of the specified NGSS component.

Grade 1 Performance Expectations		
<b>1-LS1 From Molecules to Organisms: Structures and Processes</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.	 Level 1 M1 L24–29
<b>1-LS3 Heredity: Inheritance and Variation of Traits</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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

<b>1-ESS1 Earth’s Place in the Universe</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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 to the time of year.	Level 1 M4 L9–13, 23–25
<b>1-PS4 Waves and Their Applications in Technologies for Information Transfer</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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
<b>K–2-ETS1 Engineering Design</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
K–2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	Level 1 M1 L11–15
K–2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	Level 1 M3 L21–25
K–2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	Level 1 M3 L21–25

Science and Engineering Practices		
<b>1</b>	<b>Asking Questions and Defining Problems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Ask questions based on observations to find more information about the natural and/or designed world(s).</li> </ul>	Level 1 M1 L1–3 Level 1 M2 L1–3 Level 1 M3 L1–3 Level 1 M4 L1–3, 14–16
	<ul style="list-style-type: none"> <li>Ask and/or identify questions that can be answered by an investigation.</li> </ul>	Level K M1 L8–9 Level K M3 L4–8, 22 Level 2 M3 L3–6
	<ul style="list-style-type: none"> <li>Define a simple problem that can be solved through the development of a new or improved object or tool.</li> </ul>	Level 1 M1 L11–15
<b>2</b>	<b>Developing and Using Models</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Distinguish between a model and the actual object, process, and/or events the model represents.</li> </ul>	Level 1 M1 L4–9, 18 Level 1 M3 L14
	<ul style="list-style-type: none"> <li>Compare models to identify common features and differences.</li> </ul>	Level 1 M1 L11–15 Level 1 M2 L1–3
	<ul style="list-style-type: none"> <li>Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).</li> </ul>	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
	<ul style="list-style-type: none"> <li>Develop a simple model based on evidence to represent a proposed object or tool.</li> </ul>	Level 1 M1 L11–15

3	<b>Planning and Carrying Out Investigations</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.</li> </ul>	Level 1 M1 L19–20 Level 1 M2 L15–18
	<ul style="list-style-type: none"> <li>Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.</li> </ul>	Level K M4 L3–5 Level 2 M2 L3–4, 8–12, 22–24
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) to collect data that can be used to make comparisons.</li> </ul>	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
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.</li> </ul>	Level 1 M3 L8–9, 20–25
	<ul style="list-style-type: none"> <li>Make predictions based on prior experiences.</li> </ul>	Level 1 M3 L11–13, 15–17, 26–29 Level 1 M4 L1–3
4	<b>Analyzing and Interpreting Data</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Record information (observations, thoughts, and ideas).</li> </ul>	Level 1 M1 L10
	<ul style="list-style-type: none"> <li>Use and share pictures, drawings, and/or writings of observations.</li> </ul>	Level K M2 L7–8 Level K M4 L1–2, 6–7, 10, 14–17, 20–24, 26–28
	<ul style="list-style-type: none"> <li>Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.</li> </ul>	Level 1 M1 L16–21, 27–29 Level 1 M2 L1–9 Level 1 M3 L10 Level 1 M4 L4–6, 9–13
	<ul style="list-style-type: none"> <li>Compare predictions (based on prior experiences) to what occurred (observable events).</li> </ul>	Level 1 M3 L11–13, 15–16, 26–29
	<ul style="list-style-type: none"> <li>Analyze data from tests of an object or tool to determine if it works as intended.</li> </ul>	Level 1 M3 L8–9

5	<b>Using Mathematics and Computational Thinking</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Decide when to use qualitative vs. quantitative data.</li> </ul>	Level 1 M2 L15–18
	<ul style="list-style-type: none"> <li>Use counting and numbers to identify and describe patterns in the natural and designed world(s).</li> </ul>	Level K M1 L17–21, 25–30 Level K M2 L17–20 Level 2 M4 L7–8, 20–22
	<ul style="list-style-type: none"> <li>Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.</li> </ul>	Level 2 M1 L20–22 Level 2 M3 L8–11, 23–29 Level 2 M4 L17–19
	<ul style="list-style-type: none"> <li>Use quantitative data to compare two alternative solutions to a problem.</li> </ul>	Level 1 M3 L21–25
6	<b>Constructing Explanations and Designing Solutions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul>	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
	<ul style="list-style-type: none"> <li>Use tools and materials provided to design a device that solves a specific problem.</li> </ul>	Level 1 M1 L11–15
	<ul style="list-style-type: none"> <li>Generate and/or compare multiple solutions to a problem.</li> </ul>	Level 1 M3 L21–25
7	<b>Engaging in Argument from Evidence</b>	
	<ul style="list-style-type: none"> <li>Identify arguments that are supported by evidence.</li> </ul>	Level 1 M4 L4–8, 23–25
	<ul style="list-style-type: none"> <li>Distinguish between explanations that account for all gathered evidence and those that do not.</li> </ul>	Level 1 M3 L4–6 Level 1 M4 L14–18
	<ul style="list-style-type: none"> <li>Analyze why some evidence is relevant to a scientific question and some is not.</li> </ul>	Level 1 M4 L19–25
	<ul style="list-style-type: none"> <li>Distinguish between opinions and evidence in one’s own explanations.</li> </ul>	Level 1 M4 L9–13
	<ul style="list-style-type: none"> <li>Listen actively to arguments to indicate agreement or disagreement based on evidence and/or to retell the main points of the argument.</li> </ul>	Level K M3 L17–20 Level K M4 L3–5, 11–13 Level 2 M2 L20 Level 2 M4 L4–6, 9–13, 23–25
	<ul style="list-style-type: none"> <li>Construct an argument with evidence to support a claim.</li> </ul>	Level 1 M4 L9–13, 19–21
	<ul style="list-style-type: none"> <li>Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.</li> </ul>	Level 1 M3 L8–9, 18–20



<b>8</b>	<b>Obtaining, Evaluating, and Communicating Information</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.</li> </ul>	Level 1 M1 L24–25 Level 1 M3 L18–19 Level 1 M4 L9–13
	<ul style="list-style-type: none"> <li>Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.</li> </ul>	Level 1 M4 L14–18, 23–25
	<ul style="list-style-type: none"> <li>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.</li> </ul>	Level K M3 L23–26 Level 2 M2 L5–6, 18–19 Level 2 M4 L4–9, 11–16, 23–25
	<ul style="list-style-type: none"> <li>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.</li> </ul>	Level 1 M1 L27–29 Level 1 M2 L21–23 Level 1 M3 L26–29 Level 1 M4 L23–25

<b>Disciplinary Core Ideas</b>		
<b>PS4.A</b>	<b>Wave Properties</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Sound can make matter vibrate, and vibrating matter can make sound.	Level 1 M3 L1–17, 26–29
<b>PS4.B</b>	<b>Electromagnetic Radiation</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Objects can be seen only 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. Mirrors can be used to redirect a light beam.	Level 1 M2 L1–3, 10–23
<b>PS4.C</b>	<b>Information Technologies and Instrumentation</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	People also use a variety of devices to communicate (send and receive information) over long distances.	Level 1 M3 L18–29

<b>LS1.A</b>	<b>Structure and Function</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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 and grow.	Level 1 M1 L1–15, 27–29
<b>LS1.B</b>	<b>Growth and Development of Organisms</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.	Level 1 M1 L24–29
<b>LS1.D</b>	<b>Information Processing</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Animals have body parts that capture and convey different kinds of information needed for growth and survival. 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
<b>LS3.A</b>	<b>Inheritance of Traits</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents.	Level 1 M1 L22–23, 26–29
<b>LS3.B</b>	<b>Variation of Traits</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ESS1.A</b>	<b>The Universe and Its Stars</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ESS1.B</b>	<b>Earth and the Solar System</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	Level 1 M4 L9–13, 23–25

<b>ETS1.A</b>	<b>Defining and Delimiting Engineering Problems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	A situation that people want to change or create can be approached as a problem to be solved through engineering.	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
<b>ETS1.B</b>	<b>Developing Possible Solutions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ETS1.C</b>	<b>Optimizing the Design Solution</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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

<b>Crosscutting Concepts</b>		
<b>1</b>	<b>Patterns</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.</li> </ul>	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
<b>2</b>	<b>Cause and Effect</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Events have causes that generate observable patterns.</li> </ul>	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
	<ul style="list-style-type: none"> <li>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> </ul>	Level 1 M2 L13–14 Level 1 M3 L7, 15–16

3	<b>Scale, Proportion, and Quantity</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Relative scales allow objects and events to be compared and described (e.g., bigger and smaller, hotter and colder, faster and slower).</li> </ul>	Level K M1 L1–7, 10–24, 28–30 Level K M2 L7–9, 13–15, 21–23 Level K M3 L1–3 Level K M4 L25 Level 2 M1 L8–9 Level 2 M2 L18–21 Level 2 M3 L25–29 Level 2 M4 L1–6, 17–19, 22–25
	<ul style="list-style-type: none"> <li>Standard units are used to measure length.</li> </ul>	Level 2 M3 L3–6, 14–18, 25–29
4	<b>Systems and System Models</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Objects and organisms can be described in terms of their parts.</li> </ul>	Level 1 M1 L1–6, 16–17 Level 1 M3 L1–3, 8–10, 14, 21–29
	<ul style="list-style-type: none"> <li>Systems in the natural and designed world have parts that work together.</li> </ul>	Level 1 M1 L7–8 Level 1 M2 L1–3, 10–23 Level 1 M3 L21–25
5	<b>Energy and Matter</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Objects may break into smaller pieces, be put together into larger pieces, or change shapes.</li> </ul>	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24
6	<b>Structure and Function</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>The shape and stability of structures of natural and designed objects are related to their function(s).</li> </ul>	Level 1 M1 L4–15, 27–29 Level 1 M3 L8–9
7	<b>Stability and Change</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Some things stay the same while other things change.</li> </ul>	Level K M1 L8–9, 17–21 Level 2 M2 L1–2, 22–24 Level 2 M3 L1–2, 25–29
	<ul style="list-style-type: none"> <li>Things may change slowly or rapidly.</li> </ul>	Level K M4 L14–16 Level 2 M2 L18–24

<b>Connections to Nature of Science</b>	
<b>Scientific Investigations Use a Variety of Methods</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• Science investigations begin with a question.	Level 1 M2 L15–18
• Scientists use different ways to study the world.	Level 1 M4 L4–6
<b>Scientific Knowledge Is Based on Empirical Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• Scientists look for patterns and order when making observations about the world.	Level 1 M1 L24–25 Level 1 M2 L10–12
<b>Scientific Knowledge Is Open to Revision in Light of New Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• Science knowledge can change when new information is found.	Level 1 M3 L15–16
<b>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• Scientists use drawings, sketches, and models as a way to communicate ideas.	Level 1 M4 L7–8
• Scientists search for cause and effect relationships to explain natural events.	Level 1 M2 L10–12
<b>Science Is a Way of Knowing</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• Science knowledge helps us know about the world.	Level K M2 L4–6, 9 Level K M4 L25
<b>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• Science assumes natural events happen today as they happened in the past.	Level 1 M4 L9–13
• Many events are repeated.	Level 1 M4 L9–13
<b>Science Is a Human Endeavor</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• People have practiced science for a long time.	Level 1 M4 L7–8
• Men and women of diverse backgrounds are scientists and engineers.	Level K M3 L14–16
<b>Science Addresses Questions about the Natural and Material World</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
• Scientists study the natural and material world.	Level 1 M1 L27–29 Level 1 M2 L21–23 Level 1 M3 L26–29 Level 1 M4 L23–25

<b>Connections to Engineering, Technology, and Applications of Science</b>	
<b>Interdependence of Science, Engineering, and Technology</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science and engineering involve the use of tools to observe and measure things.</li> </ul>	Level 2 M3 L3–6, 14–18
<b>Influence of Engineering, Technology, and Science on Society and the Natural World</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials.</li> </ul>	Level 1 M1 L10–15
<ul style="list-style-type: none"> <li>Taking natural materials to make things impacts the environment.</li> </ul>	Level K M4 L11–13
<ul style="list-style-type: none"> <li>People depend on various technologies in their lives; human life would be very different without technology.</li> </ul>	Level 1 M3 L20

## Oregon 2014 Science Standards (NGSS) Correlation to *PhD Science*®

- Green indicates that *PhD Science*® fully addresses the standard within the grade level or the K–2 grade band.
- Blue indicates that *PhD Science* covers the standard but in a different grade band.
- Yellow indicates that *PhD Science* partially covers the standard within the grade level or grade band.
- Red indicates that *PhD Science* does not cover the standard within the grade level or grade band.

**Key:** Module (M), Lesson(L)

### *PhD Science* Level 2

The Grade 2 Oregon 2014 Science Standards(NGSS) are fully covered by the *PhD Science* K–2 curriculum. A detailed analysis of alignment appears in the table below. The lessons listed address the full and partial language of the specified NGSS component.

Grade 2 Performance Expectations		
<b>2-LS2 Ecosystems: Interactions, Energy, and Dynamics</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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
<b>2-LS4 Biological Evolution: Unity and Diversity</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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
<b>2-ESS1 Earth’s Place in the Universe</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
2-ESS1-1	Use observations from several sources to provide evidence that Earth events can occur quickly or slowly.	Level 2 M2 L18–24

<b>2-ESS2 Earth's Systems</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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 shapes and kinds 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
<b>2-PS1 Matter and Its Interactions</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
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 an 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
<b>K–2-ETS1 Engineering Design</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
K–2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	Level 2 M1 L24–28 Level 2 M2 L8–12
K–2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	Level 2 M3 L14–18
K–2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	Level 2 M2 L8–12, 14–17



Science and Engineering Practices		
<b>1</b>	<b>Asking Questions and Defining Problems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Ask questions based on observations to find more information about the natural and/or designed world(s).</li> </ul>	Level 2 M1 L1–3 Level 2 M2 L1–2 Level 2 M3 L1–2 Level 2 M4 L1–3
	<ul style="list-style-type: none"> <li>Ask and/or identify questions that can be answered by an investigation.</li> </ul>	Level 2 M3 L3–6
	<ul style="list-style-type: none"> <li>Define a simple problem that can be solved through the development of a new or improved object or tool.</li> </ul>	Level 2 M3 L14–18
<b>2</b>	<b>Developing and Using Models</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Distinguish between a model and the actual object, process, and/or events the model represents.</li> </ul>	Level 2 M4 L4–6
	<ul style="list-style-type: none"> <li>Compare models to identify common features and differences.</li> </ul>	Level 2 M4 L1–6, 20–21, 23–25
	<ul style="list-style-type: none"> <li>Develop a model to represent patterns in the natural world.</li> </ul>	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
	<ul style="list-style-type: none"> <li>Develop a simple model based on evidence to represent a proposed object or tool.</li> </ul>	Level 2 M3 L14–18
<b>3</b>	<b>Planning and Carrying Out Investigations</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</li> </ul>	Level 2 M2 L8–12 Level 2 M3 L3–7 Level 2 M4 L17–19
	<ul style="list-style-type: none"> <li>Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.</li> </ul>	Level 2 M2 L3–4, 8–12, 22–24
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) to collect data which can be used to make comparisons.</li> </ul>	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
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.</li> </ul>	Level 2 M1 L20–22, 24–28 Level 2 M2 L14–17
	<ul style="list-style-type: none"> <li>Make predictions based on prior experiences.</li> </ul>	Level 2 M1 L17–18

4	<b>Analyzing and Interpreting Data</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Record information (observations, thoughts, and ideas).</li> </ul>	Level 2 M1 L4–7, 10–11, 14–18
	<ul style="list-style-type: none"> <li>Use and share pictures, drawings, and/or writings of observations.</li> </ul>	Level K M2 L7–8 Level K M4 L1–2, 6–7, 10, 14–17, 20–24, 26–28
	<ul style="list-style-type: none"> <li>Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.</li> </ul>	Level 2 M1 L4–11 Level 2 M2 L5–6, 8–9 Level 2 M3 L19–20 Level 2 M4 L22–25
	<ul style="list-style-type: none"> <li>Compare predictions (based on prior experiences) to what occurred (observable events).</li> </ul>	Level K M4 L14–16 Level 1 M3 L11–13, 15–16, 26–29
	<ul style="list-style-type: none"> <li>Analyze data from tests of an object or tool to determine if it works as intended.</li> </ul>	Level 2 M1 L20–22, 24–28 Level 2 M3 L14–18
5	<b>Using Mathematics and Computational Thinking</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Decide when to use qualitative vs. quantitative data.</li> </ul>	Level K M2 L17–20 Level 1 M2 L15–18
	<ul style="list-style-type: none"> <li>Use counting and numbers to identify and describe patterns in the natural and designed world(s).</li> </ul>	Level 2 M4 L7–8, 20–22
	<ul style="list-style-type: none"> <li>Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.</li> </ul>	Level 2 M1 L20–22 Level 2 M3 L8–11, 23–29 Level 2 M4 L17–19
	<ul style="list-style-type: none"> <li>Use quantitative data to compare two alternative solutions to a problem.</li> </ul>	Level 2 M2 L14–17
6	<b>Constructing Explanations and Designing Solutions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul>	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
	<ul style="list-style-type: none"> <li>Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.</li> </ul>	Level 2 M1 L24–28
	<ul style="list-style-type: none"> <li>Compare multiple solutions to a problem.</li> </ul>	Level 2 M2 L8–12, 14–17

7	<b>Engaging in Argument from Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Identify arguments that are supported by evidence.</li> </ul>	Level K M3 L17–18 Level 1 M4 L4–8, 23–25
	<ul style="list-style-type: none"> <li>Distinguish between explanations that account for all gathered evidence and those that do not.</li> </ul>	Level 1 M3 L4–6 Level 1 M4 L14–18
	<ul style="list-style-type: none"> <li>Analyze why some evidence is relevant to a scientific question and some is not.</li> </ul>	Level 2 M4 L20–21
	<ul style="list-style-type: none"> <li>Distinguish between opinions and evidence in one’s own explanations.</li> </ul>	Level K M3 L17–18 Level 1 M4 L9–13
	<ul style="list-style-type: none"> <li>Listen actively to arguments to indicate agreement or disagreement based on evidence and/or to retell the main points of the argument.</li> </ul>	Level 2 M2 L20 Level 2 M4 L4–6, 9–13, 23–25
	<ul style="list-style-type: none"> <li>Construct an argument with evidence to support a claim.</li> </ul>	Level 2 M2 L3–4, 10–13, 21–24 Level 2 M4 L16
	<ul style="list-style-type: none"> <li>Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.</li> </ul>	Level 2 M3 L14–18, 21–22
8	<b>Obtaining, Evaluating, and Communicating Information</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>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 and designed world(s).</li> </ul>	Level 2 M2 L1–2, 14–17
	<ul style="list-style-type: none"> <li>Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.</li> </ul>	Level 2 M3 L14–18
	<ul style="list-style-type: none"> <li>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.</li> </ul>	Level 2 M2 L5–6, 18–19 Level 2 M4 L4–9, 11–16, 23–25
	<ul style="list-style-type: none"> <li>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.</li> </ul>	Level 2 M1 L29–31 Level 2 M2 L22–24 Level 2 M3 L8–12, 14–20, 25–29 Level 2 M4 L23–25

<b>Disciplinary Core Ideas</b>		
<b>PS1.A</b>	<b>Structure and Properties of Matter</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. 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
<b>PS1.B</b>	<b>Chemical Reactions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>LS2.A</b>	<b>Interdependent Relationships in Ecosystems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>LS4.D</b>	<b>Biodiversity and Humans</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ESS1.C</b>	<b>The History of Planet Earth</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Some events happen very quickly; others occur very slowly over a time period much longer than one can observe.	Level 2 M2 L18–24
<b>ESS2.A</b>	<b>Earth Materials and Systems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	Wind and water can change the shape of the land.	Level 2 M2 L1–17, 20, 22–24
<b>ESS2.B</b>	<b>Plate Tectonics and Large-Scale System Interactions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ESS2.C</b>	<b>The Roles of Water in Earth’s Surface Processes</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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

<b>ETS1.A</b>	<b>Defining and Delimiting Engineering Problems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	A situation that people want to change or create can be approached as a problem to be solved through engineering.	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
<b>ETS1.B</b>	<b>Developing Possible Solutions</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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
<b>ETS1.C</b>	<b>Optimizing the Design Solution</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	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

<b>Crosscutting Concepts</b>		
<b>1</b>	<b>Patterns</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Patterns in the natural and human designed world can be observed.</li> </ul>	Level 2 M1 L4–9 Level 2 M2 L1–2, 5–6 Level 2 M4 L1–8, 11–15, 20–21, 23–25
<b>2</b>	<b>Cause and Effect</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Events have causes that generate observable patterns.</li> </ul>	Level 2 M1 L14–19, 29–31 Level 2 M2 L20–21 Level 2 M3 L8–11
	<ul style="list-style-type: none"> <li>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> </ul>	Level 2 M1 L14–18 Level 2 M2 L8–12 Level 2 M3 L3–7

3	<b>Scale, Proportion, and Quantity</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Relative scales allow objects and events to be compared and described (e.g., bigger and smaller, hotter and colder, faster and slower).</li> </ul>	Level 2 M1 L8–9 Level 2 M2 L18–21 Level 2 M3 L25–29 Level 2 M4 L1–6, 17–19, 22–25
	<ul style="list-style-type: none"> <li>Standard units are used to measure length.</li> </ul>	Level 2 M3 L3–6, 14–18, 25–29
4	<b>Systems and System Models</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Objects and organisms can be described in terms of their parts.</li> </ul>	Level 2 M1 L1–7, 12–13, 20–23, 29–31 Level 2 M2 L3–4, 7 Level 2 M3 L8–13, 19–24
	<ul style="list-style-type: none"> <li>Systems in the natural and designed world have parts that work together.</li> </ul>	Level 2 M2 L8–12, 14–17 Level 2 M4 L7–16, 23–25
5	<b>Energy and Matter</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Objects may break into smaller pieces and be put together into larger pieces or change shapes.</li> </ul>	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24
6	<b>Structure and Function</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>The shape and stability of structures of natural and designed objects are related to their function(s).</li> </ul>	Level 2 M1 L24–28 Level 2 M2 L14–17 Level 2 M3 L8–11, 14–22
7	<b>Stability and Change</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
	<ul style="list-style-type: none"> <li>Some things stay the same while other things change.</li> </ul>	Level 2 M2 L1–2, 22–24 Level 2 M3 L1–2, 25–29
	<ul style="list-style-type: none"> <li>Things may change slowly or rapidly.</li> </ul>	Level 2 M2 L18–24

<b>Connections to Nature of Science</b>	
<b>Scientific Investigations Use a Variety of Methods</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science investigations begin with a question.</li> </ul>	Level K M1 L8–9 Level K M4 L20–24 Level 1 M2 L15–18
<ul style="list-style-type: none"> <li>Scientists use different ways to study the world.</li> </ul>	Level K M2 L16 Level 1 M4 L4–6
<b>Scientific Knowledge Is Based on Empirical Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Scientists look for patterns and order when making observations about the world.</li> </ul>	Level 2 M4 L11–13, 17–21
<b>Scientific Knowledge Is Open to Revision in Light of New Evidence</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science knowledge can change when new information is found.</li> </ul>	Level 2 M4 L4–6
<b>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Scientists use drawings, sketches, and models as a way to communicate ideas.</li> </ul>	Level 2 M4 L14–17
<ul style="list-style-type: none"> <li>Science searches for cause and effect relationships to explain natural events.</li> </ul>	Level 2 M2 L10–12
<b>Science Is a Way of Knowing</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science knowledge helps us know about the world.</li> </ul>	Level K M2 L4–6, 9 Level K M4 L25
<b>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science assumes natural events happen today as they happened in the past.</li> </ul>	Level 2 M2 L20–21
<ul style="list-style-type: none"> <li>Many events are repeated.</li> </ul>	Level K M1 L17–20 Level 1 M4 L9–13
<b>Science Is a Human Endeavor</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>People have practiced science for a long time.</li> </ul>	Level K M3 L14–16 Level 1 M4 L7–8
<ul style="list-style-type: none"> <li>Men and women of diverse backgrounds are scientists and engineers.</li> </ul>	Level K M3 L14–16
<b>Science Addresses Questions About the Natural and Material World</b>	<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Scientists study the natural and material world.</li> </ul>	Level 2 M1 L20–22, 29–31 Level 2 M2 L1–4, 22–24 Level 2 M3 L25–29 Level 2 M4 L23–25

<b>Connections to Engineering, Technology, and Applications of Science</b>		
<b>Interdependence of Science, Engineering, and Technology</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Science and engineering involve the use of tools to observe and measure things.</li> </ul>		Level 2 M3 L3–6, 14–18
<b>Influence of Engineering, Technology, and Science on Society and the Natural World</b>		<b>Aligned <i>PhD Science</i> Lessons</b>
<ul style="list-style-type: none"> <li>Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.</li> </ul>		Level 2 M2 L14–17 Level 2 M3 L14–18
<ul style="list-style-type: none"> <li>Taking natural materials to make things impacts the environment.</li> </ul>		Level K M4 L11–13
<ul style="list-style-type: none"> <li>Developing and using technology has impacts on the natural world.</li> </ul>		Level 2 M2 L8–9