PhD Science® K–5 Curriculum Correlation to the Wisconsin Standards for Science (WSS)

Contents

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Disciplinary Core Ideas Level K

The *PhD Science* Level K curriculum fully aligns with the Kindergarten WSS. A detailed analysis of alignment with disciplinary core ideas follows.

Key: Module (M), Lesson (L)

Kindergarten Disciplinary Core Ideas, Standards, Learning Priorities, and Performance Indicators

Life Science 1 (LS1)—Structures and Processes

Standard SCI.LS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *structures and processes (on a scale from molecules to organisms)* to make sense of phenomena and solve problems.

SCI.LS1.C.K: Organization for Matter and Energy Flow in Organisms	**Aligned *PhD Science* Lessons**
Animals obtain food they need from plants or other animals. Plants need water and light.	Level K M3 L4–16, 19–20, 22, 27–29

Physical Science 2 (PS2)—Forces, Interactions, Motion, and Stability

Standard SCI.PS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *forces, interactions, motion, and stability* to make sense of phenomena and solve problems.

SCI.PS2.A.K: Forces and Motion	**Aligned *PhD Science* Lessons**
Pushes and pulls can have different strengths and directions, and can change the speed or direction of an object's motion, or start or stop it.	Level K M2 L1–23
A bigger push or pull makes things speed up or slow down more quickly.	Level K M2 L7–9, 21–23

SCI.PS2.B.K: Types of Interactions	**Aligned *PhD Science* Lessons**
When objects touch or collide, they push on one another and can result in a change of motion.	Level K M2 L13–23

Physical Science 3 (PS3)—Energy

Standard SCI.PS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *energy* to make sense of phenomena and solve problems.

SCI.PS3.C.K: Relationships Between Energy and Forces	**Aligned *PhD Science* Lessons**
Bigger pushes and pulls cause bigger changes in an object's motion or shape.	Level K M2 L7–9, 21–23

SCI.PS3.D.K: Energy in Chemical Processes and Everyday Life	**Aligned *PhD Science* Lessons**
Sunlight warms Earth's surface.	Level K M1 L8–16, 28–30

Earth and Space Science 2 (ESS2)—Earth's Systems

Standard SCI.ESS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's systems* to make sense of phenomena and solve problems.

SCI.ESS2.D.K: Weather and Climate	**Aligned *PhD Science* Lessons**
Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region and time. People record weather patterns over time.	Level K M1 L1–11, 17–24, 28–30 Level K M4 L25

SCI.ESS2.E.K: Biogeology	**Aligned *PhD Science* Lessons**
Plants and animals can change their local environment.	Level K M4 L1–10, 14–16, 26–28

Earth and Space Science 3 (ESS3)—Earth and Human Activity

Standard SCI.ESS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth and human activity* to make sense of phenomena and solve problems.

SCI.ESS3.A.K: 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

SCI.ESS3.B.K: Natural Hazards	**Aligned *PhD Science* Lessons**
In a region, some kinds of severe weather are more likely than others. Forecasts allow communities to prepare for severe weather.	Level K M1 L17–20, 22–30

SCI.ESS3.C.K: Human Impacts on Earth Systems	**Aligned *PhD Science* Lessons**
Things people do can affect the environment but they can make choices to reduce their impacts.	Level K M4 L11–24, 26–28

Engineering, Technology, and the Application of Science 1 (ETS1)—Engineering Design

Standard SCI.ETS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *engineering design* to make sense of phenomena and solve problems.

SCI.ETS1.A.K–2: 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.	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

SCI.ETS1.B.K–2: 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

Engineering, Technology, and the Application of Science 2 (ETS2)—Links Among Engineering, Technology, Science, and Society

Standard SCI.ETS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *links among engineering, technology, science, and society* to make sense of phenomena and solve problems.

SCI.ETS2.A.K–2: Interdependence of Science, Engineering, and Technology	**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

SCI.ETS2.B.K–2: Influence of Engineering, Technology, and Science on Society and the Natural World	**Aligned *PhD Science* Lessons**
Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials.	Level K M4 L11–13
Taking natural materials to make things impacts the environment.	Level 1 M1 L10–15 Level 2 M2 L14–17 Level 2 M3 L14–18

Engineering, Technology, and the Application of Science 3 (ETS3)—Nature of Science and Engineering

Standard SCI.ETS3: Students use science and engineering practices, crosscutting concepts, and an understanding of the *nature of science and engineering* to make sense of phenomena and solve problems.

SCI.ETS3.A.K–2: Science and Engineering Are Human Endeavors	**Aligned *PhD Science* Lessons**
People of diverse backgrounds can become scientists and engineers.	Level K M3 L14–16
People have practiced science and engineering for a long time.	Level K M3 L14–16
Creativity and imagination are important to science and engineering.	Level K M1 L12–16 Level K M2 L17–20 Level K M3 L4–8 Level K M4 L20–24

SCI.ETS3.B.K–2: Science and Engineering Are Unique Ways of Thinking with Different Purposes	**Aligned *PhD Science* Lessons**
Scientists use evidence to explain the natural world.	Level K M2 L16
Science assumes natural events happen today as they happened in the past.	Level K M1 L21
Engineers solve problems to meet the needs of people and communities.	Level K M1 L12–16 Level K M2 L17–20 Level K M4 L20–24

SCI.ETS3.C.K–2: Science and Engineering Use Multiple Approaches to Create New Knowledge and Solve Problems	**Aligned *PhD Science* Lessons**
Science and engineers use many approaches to answer questions about the natural world and solve problems.	Level K M3 L1–3 Level K M4 L25
Scientific explanations are strengthened by being supported with evidence.	Level K M2 L4–6, 9 Level K M4 L25
An engineering problem can have many solutions. The strength of a solution depends on how well it solves the problem.	Level K M1 L12–16 Level K M2 L17–20 Level K M4 L20–24

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Three-Dimensional Performance Indicators Level K

The *PhD Science* Level K curriculum fully aligns with the Kindergarten WSS. A detailed analysis of alignment with three-dimensional performance indicators follows.

Key: Module (M), Lesson (L)

Kindergarten Three-Dimensional Performance Indicators

Life Science (SCI.LS)

LS1	**Structures and Processes**	**Aligned *PhD Science* Lessons**
K-LS1-1	Use observations to describe patterns of what plants and animals (including humans) need to survive.	Level K M3 L4–16, 19–22, 27–29

Physical Science (SCI.PS)

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

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

Earth and Space Science (SCI.ESS)

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

ESS3	Earth and Human Activity	Aligned *PhD Science* Lessons
K-ESS3-1	Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.	Level K M3 L1–3, 9–29 Level K M4 L1–2, 8–9, 11–13
K-ESS3-2	Ask questions to 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, or other living things in the local environment.	Level K M4 L14–24, 26–28

Engineering, Technology, and the Application of Science (SCI.ETS)

ETS1	Engineering Design	Aligned *PhD Science* Lessons
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

ETS3	Nature of Science and Engineering	Aligned *PhD Science* Lessons
K-ETS3-1	Compare data from two types of investigations to show that pushes and pulls of different strengths have different effects.	Level K M2 L1–23

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Disciplinary Core Ideas Level 1

The *PhD Science* Level 1 curriculum fully aligns with the Grade 1 WSS. A detailed analysis of alignment with disciplinary core ideas follows.

Key: Module (M), Lesson (L)

Grade 1 Disciplinary Core Ideas, Standards, Learning Priorities, and Performance Indicators

Life Science 1 (LS1)—Structures and Processes

Standard SCI.LS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *structures and processes (on a scale from molecules to organisms)* to make sense of phenomena and solve problems.

SCI.LS1.A.1: Structure and Function	**Aligned *PhD Science* Lessons**
All organisms have external parts that they use to perform daily functions.	Level 1 M1 L1–15, 27–29

SCI.LS1.B.1: Growth and Development of Organisms	**Aligned *PhD Science* Lessons**
Parents and offspring often engage in behaviors that help the offspring survive.	Level 1 M1 L24–29

SCI.LS1.D.1: Information Processing	**Aligned *PhD Science* Lessons**
Animals sense and communicate information and respond to inputs with behaviors that help them grow and survive.	Level 1 M1 L16–21, 27–29

Life Science 3 (LS3)—Heredity

Standard SCI.LS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *heredity* to make sense of phenomena and solve problems.

SCI.LS3.A.1: Inheritance of Traits	**Aligned *PhD Science* Lessons**
Young organisms are very much, but not exactly, like their parents, and also resemble other organisms of the same kind.	Level 1 M1 L22–23, 26–29

SCI.LS3.B.1: 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

Physical Science 4 (PS4)—Waves and Their Applications in Technologies for Information Transfer

Standard SCI.PS4: Students use science and engineering practices, crosscutting concepts, and an understanding of *waves and their applications in technologies for information transfer* to make sense of phenomena and solve problems.

SCI.PS4.A.1: Wave Properties	**Aligned *PhD Science* Lessons**
Sound can make matter vibrate, and vibrating matter can make sound.	Level 1 M3 L1–17, 26–29

SCI.PS4.B.1: Electromagnetic Radiation	**Aligned *PhD Science* Lessons**
Objects can be seen only when light is available to illuminate them.	Level 1 M2 L1–9, 21–23

SCI.PS4.C.1: Information Technologies and Instrumentation	**Aligned *PhD Science* Lessons**
People use devices to send and receive information.	Level 1 M3 L18–29

Earth and Space Science 1 (ESS1)—Earth's Place in the Universe

Standard SCI.ESS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's place in the universe* to make sense of phenomena and solve problems.

SCI.ESS1.A.1: The Universe and Its Stars	**Aligned *PhD Science* Lessons**
Patterns of movement of the sun, moon, and stars, as seen from Earth, can be observed, described, and predicted.	Level 1 M4 L1–8, 14–25

SCI.ESS1.B.1: 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

Engineering, Technology, and the Application of Science 1 (ETS1)—Engineering Design

Standard SCI.ETS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *engineering design* to make sense of phenomena and solve problems.

SCI.ETS1.A.K–2: 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.	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

SCI.ETS1.B.K–2: 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

Engineering, Technology, and the Application of Science 2 (ETS2)—Links Among Engineering, Technology, Science, and Society

Standard SCI.ETS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *links among engineering, technology, science, and society* to make sense of phenomena and solve problems.

SCI.ETS2.A.K–2: Interdependence of Science, Engineering, and Technology	**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

SCI.ETS2.B.K–2: Influence of Engineering, Technology, and Science on Society and the Natural World	**Aligned *PhD Science* Lessons**
Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials.	Level 1 M1 L10–15
Taking natural materials to make things impacts the environment.	Level 1 M1 L10–15

Engineering, Technology, and the Application of Science 3 (ETS3)—Nature of Science and Engineering

Standard SCI.ETS3: Students use science and engineering practices, crosscutting concepts, and an understanding of the *nature of science and engineering* to make sense of phenomena and solve problems.

SCI.ETS3.A.K–2: Science and Engineering Are Human Endeavors	**Aligned *PhD Science* Lessons**
People of diverse backgrounds can become scientists and engineers.	Level K M3 L14–16
People have practiced science and engineering for a long time.	Level 1 M4 L7–8
Creativity and imagination are important to science and engineering.	Level 1 M1 L11–15 Level 1 M2 L15–18 Level 1 M3 L21–25 Level 1 M4 L9–13

SCI.ETS3.B.K–2: Science and Engineering Are Unique Ways of Thinking with Different Purposes	**Aligned *PhD Science* Lessons**
Scientists use evidence to explain the natural world.	Level 1 M4 L4–6
Science assumes natural events happen today as they happened in the past.	Level 1 M4 L9–13
Engineers solve problems to meet the needs of people and communities.	Level 1 M3 L21–25

SCI.ETS3.C.K–2: Science and Engineering Use Multiple Approaches to Create New Knowledge and Solve Problems	**Aligned *PhD Science* Lessons**
Science and engineers use many approaches to answer questions about the natural world and solve problems.	Level K M3 L1–3 Level K M4 L25
Scientific explanations are strengthened by being supported with evidence.	Level K M2 L4–6, 9 Level K M4 L25
An engineering problem can have many solutions. The strength of a solution depends on how well it solves the problem.	Level 1 M1 L11–15 Level 1 M2 L15–18 Level 1 M3 L21–25 Level 1 M4 L9–13

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Three-Dimensional Performance Indicators Level 1

The *PhD Science* Level 1 curriculum fully aligns with the Grade 1 WSS. A detailed analysis of alignment with three-dimensional performance indicators follows.

Key: Module (M), Lesson (L)

Grade 1 Three-Dimensional Performance Indicators

Life Science (SCI.LS)

LS1	Structures and Processes	Aligned *PhD Science* Lessons
1-LS1-1	Use materials to design a solution to a human problem by mimicking how plants 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
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

Physical Science (SCI.PS)

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

Earth and Space Science (SCI.ESS)

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

Engineering, Technology, and the Application of Science (SCI.ETS)

ETS1	Engineering Design	Aligned *PhD Science* Lessons
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

ETS3	Nature of Science and Engineering	Aligned *PhD Science* Lessons
1-ETS3-1	Construct an argument with evidence that humans today and long ago have used ideas from plants and animals to help them survive.	Level 1 M1 L1–15, 27–29

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Disciplinary Core Ideas Level 2

The *PhD Science* Level 2 curriculum fully aligns with the Grade 2 WSS. A detailed analysis of alignment with disciplinary core ideas follows.

Key: Module (M), Lesson (L)

Grade 2 Disciplinary Core Ideas, Standards, Learning Priorities, and Performance Indicators

Life Science 2 (LS2)—Interactions, Energy, and Dynamics Within Ecosystems

Standard SCI.LS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *interactions, energy, and dynamics within ecosystems* to make sense of phenomena and solve problems.

SCI.LS2.A.2: Interdependent Relationships in Ecosystems	**Aligned *PhD Science* Lessons**
Plants depend on water and light to grow. Plants depend on animals for pollination or to move their seeds around.	Level 2 M3 L1–29

Life Science 4 (LS4)—Biological Evolution

Standard SCI.LS4: Students use science and engineering practices, crosscutting concepts, and an understanding of *biological evolution* to make sense of phenomena and solve problems.

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

Physical Science 1 (PS1)—Matter and Its Interactions

Standard SCI.PS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *matter and its interactions* to make sense of phenomena and solve problems.

SCI.PS1.A.2: Structures and Properties of Matter	**Aligned *PhD Science* Lessons**
Matter exists as different substances that have different observable properties. Different properties are suited to different purposes. Objects can be built up from smaller parts.	Level 2 M1 L1–16, 19, 23, 24–31 Level 2 M2 L3–4, 14–17

SCI.PS1.B.2: 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

Earth and Space Science 1 (ESS1)—Earth's Place in the Universe

Standard SCI.ESS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's place in the universe* to make sense of phenomena and solve problems.

SCI.ESS1.C.2: The History of Planet Earth	**Aligned *PhD Science* Lessons**
Some events on Earth occur very quickly; others can occur very slowly.	Level 2 M2 L18–24

Earth and Space Science 2 (ESS2)—Earth's Systems

Standard SCI.ESS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's systems* to make sense of phenomena and solve problems.

SCI.ESS2.A.2: Earth Materials and Systems	**Aligned *PhD Science* Lessons**
Wind and water change the shape of the land.	Level 2 M2 L1–17, 20, 22–24

SCI.ESS2.B.2: 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

SCI.ESS2.C.2: The Roles of Water in Earth's Surface Processes	**Aligned *PhD Science* Lessons**
Water is found in many types of places and in different forms on Earth.	Level 2 M4 L1–6, 16, 22–25

Engineering, Technology, and the Application of Science 1 (ETS1)—Engineering Design

Standard SCI.ETS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *engineering design* to make sense of phenomena and solve problems.

SCI.ETS1.A.K–2: 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.	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

SCI.ETS1.B.K–2: 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

SCI.ETS1.C.2: Optimizing the Design Solution	**Aligned *PhD Science* Lessons**
Because there is more than one possible solution to a problem, it is useful to compare and test designs.	Level 2 M2 L8–12, 14–17

Engineering, Technology, and the Application of Science 2 (ETS2)—Links Among Engineering, Technology, Science, and Society

Standard SCI.ETS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *links among engineering, technology, science, and society* to make sense of phenomena and solve problems.

SCI.ETS2.A.K–2: Interdependence of Science, Engineering, and Technology	**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

SCI.ETS2.B.K–2: Influence of Engineering, Technology, and Science on Society and the Natural World	**Aligned *PhD Science* Lessons**
Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials.	Level 2 M2 L14–17 Level 2 M3 L14–18
Taking natural materials to make things impacts the environment.	Level 2 M2 L14–17 Level 2 M3 L14–18

Engineering, Technology, and the Application of Science 3 (ETS3)—Nature of Science and Engineering

Standard SCI.ETS3: Students use science and engineering practices, crosscutting concepts, and an understanding of the *nature of science and engineering* to make sense of phenomena and solve problems.

SCI.ETS3.A.K–2: Science and Engineering Are Human Endeavors	**Aligned *PhD Science* Lessons**
People of diverse backgrounds can become scientists and engineers.	Level K M3 L14–16
People have practiced science and engineering for a long time.	Level K M3 L14–16 Level 1 M4 L7–8
Creativity and imagination are important to science and engineering.	Level 2 M1 L24–28 Level 2 M2 L14–17 Level 2 M3 L14–18 Level 2 M4 L17–19

SCI.ETS3.B.K–2: Science and Engineering Are Unique Ways of Thinking with Different Purposes	**Aligned *PhD Science* Lessons**
Scientists use evidence to explain the natural world.	Level 1 M4 L4–6
Science assumes natural events happen today as they happened in the past.	Level 2 M2 L20–21
Engineers solve problems to meet the needs of people and communities.	Level 2 M1 L24–28 Level 2 M2 L14–17 Level 2 M3 L14–18

SCI.ETS3.C.K–2: Science and Engineering Use Multiple Approaches to Create New Knowledge and Solve Problems	**Aligned *PhD Science* Lessons**
Science and engineers use many approaches to answer questions about the natural world and solve problems.	Level K M3 L1–3 Level K M4 L25
Scientific explanations are strengthened by being supported with evidence.	Level K M2 L4–6, 9 Level K M4 L25
An engineering problem can have many solutions. The strength of a solution depends on how well it solves the problem.	Level 2 M1 L24–28 Level 2 M2 L14–17 Level 2 M3 L14–18

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Three-Dimensional Performance Indicators Level 2

The *PhD Science* Level 2 curriculum fully aligns with the Grade 2 WSS. A detailed analysis of alignment with three-dimensional performance indicators follows.

Key: Module (M), Lesson (L)

Grade 2 Three-Dimensional Performance Indicators

Life Science (SCI.LS)

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

LS4	**Biodiversity and Humans**	**Aligned *PhD Science* Lessons**
2-LS4-1	Make observations of plants and animals to compare the diversity of life in different habitats.	Level 2 M4 L1–3, 7–25

Physical Science (SCI.PS)

PS1	Matter and Its Interactions	Aligned *PhD Science* Lessons
2-PS1-1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	Level 2 M1 L1–9, 12–16, 19, 23, 29–31 Level 2 M2 L3–4, 14–17
2-PS1-2	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for 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

Earth and Space Science (SCI.ESS)

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

ESS2	Earth's Systems	Aligned *PhD Science* Lessons
2-ESS2-1	Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	Level 2 M2 L1–17, 20, 22–24
2-ESS2-2	Develop a model to represent the 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

Engineering, Technology, and the Application of Science (SCI.ETS)

ETS1	Engineering Design	Aligned *PhD Science* Lessons
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

ETS3	Nature of Science and Engineering	Aligned *PhD Science* Lessons
2-ETS3-1	Design creative solutions to a problem caused when there is a quick change to the earth's surface (e.g. natural disasters).	Level 2 M2 L18–24

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Crosscutting Concepts K–2

The *PhD Science* Levels K–2 curriculum fully aligns with the WSS K–2 crosscutting concepts standards. A detailed analysis of alignment follows.

Key: Module (M), Lesson (L)

K–2 Grade Band Crosscutting Concepts Standards, Learning Priorities, and Performance Indicators

CC1: Patterns

Standard SCI.CC1: Students use science and engineering practices, disciplinary core ideas, and *patterns* to make sense of phenomena and solve problems.

SCI.CC1.K–2	**Aligned *PhD Science* Lessons**
Students recognize that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.	Level K M1 L17–30 Level K M2 L1–6, 17–20 Level K M3 L4–8, 14–20, 22, 26–29 Level K M4 L3–5 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 Level 2 M1 L4–9 Level 2 M2 L1–2, 5–6 Level 2 M4 L1–8, 11–15, 20–21, 23–25

CC2: Cause and Effect

Standard SCI.CC2: Students use science and engineering practices, disciplinary core ideas, and *cause and effect* relationships to make sense of phenomena and solve problems.

SCI.CC2.K–2	**Aligned *PhD Science* Lessons**
Students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.	Level K M2 L4–9, 13–16, 21–23 Level K M3 L28–29 Level K M4 L3–5, 10, 14–19, 26–28 Level 1 M2 L1–7, 10–23 Level 1 M3 L4–7, 14–17, 26–29 Level 1 M4 L4–6, 9–13, 17–21, 23–25 Level 2 M1 L14–19, 29–31 Level 2 M2 L8–12, 20–21 Level 2 M3 L3–11

CC3: Scale, Proportion, and Quantity

Standard SCI.CC3: Students use science and engineering practices, disciplinary core ideas, and an understanding of *scale, proportion, and quantity* to make sense of phenomena and solve problems.

SCI.CC3.K–2	**Aligned *PhD Science* Lessons**
Students use relative scales (e.g., bigger and smaller; hotter and colder; faster and slower) to describe objects. They use standard units to measure length.	Level K M1 L1–7, 10–24, 28–30 Level K M2 L7–9, 13–15, 21–23 Level K M3 L1–3 Level K M4 L25 Level 2 M1 L8–9 Level 2 M2 L18–21 Level 2 M3 L3–6, 14–18, 25–29 Level 2 M4 L1–6, 17–19, 22–25

CC4: Systems and System Models

Standard SCI.CC4: Students use science and engineering practices, disciplinary core ideas, and an understanding of *systems and system models* to make sense of phenomena and solve problems.

SCI.CC4.K–2	**Aligned *PhD Science* Lessons**
Students understand objects and organisms can be described in terms of their parts and that systems in the natural and designed world have parts that work together.	Level K M3 L1–3, 9–13, 19–21, 23–25, 27–29 Level K M4 L1–9, 11–16 Level 1 M1 L1–8, 16–17 Level 1 M2 L1–3, 10–23 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, 7–12, 14–17 Level 2 M3 L8–13, 19–24 Level 2 M4 L7–16, 23–25

CC5: Energy and Matter

Standard SCI.CC5: Students use science and engineering practices, disciplinary core ideas, and an understanding of *energy and matter* to make sense of phenomena and solve problems.

SCI.CC5.K–2	**Aligned *PhD Science* Lessons**
Students observe objects may break into smaller pieces, be put together into larger pieces, or change shapes.	Level 2 M1 L10–11, 29–31 Level 2 M2 L3–4, 8–13, 22–24

CC6: Structure and Function

Standard SCI.CC6: Students use science and engineering practices, disciplinary core ideas, and an understanding of *structure and function* to make sense of phenomena and solve problems.

SCI.CC6.K–2	**Aligned *PhD Science* Lessons**
Students observe the shape and stability of structures of natural and designed objects are related to their function(s).	Level K M1 L10–16 Level K M4 L20–24 Level 1 M1 L4–15, 27–29 Level 1 M3 L8–9 Level 2 M1 L24–28 Level 2 M2 L14–17 Level 2 M3 L8–11, 14–22

CC7: Stability and Change

Standard SCI.CC7: Students use science and engineering practices, disciplinary core ideas, and an understanding of *stability and change* to make sense of phenomena and solve problems.

SCI.CC7.K–2	**Aligned *PhD Science* Lessons**
Students observe some things stay the same while other things change, and things may change slowly or rapidly.	Level K M1 L8–9, 17–21 Level K M4 L14–16 Level 2 M2 L1–2, 18–24 Level 2 M3 L1–2, 25–29

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Science and Engineering Practices K–2

The *PhD Science* Level K–2 curriculum fully aligns with the WSS K–2 science and engineering practices standards. A detailed analysis of alignment follows.

Key: Module (M), Lesson (L)

K–2 Grade Band Science and Engineering Standards, Learning Priorities, and Performance Indicators

SEP1: Asking Questions and Defining Problems

Standard SCI.SEP1: Students *ask questions and define problems*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP1.A.K–2: Asking Questions Students ask simple descriptive questions that can be tested. This includes the following:	**Aligned *PhD Science* Lessons**
Ask questions based on observations to find more information about the natural world.	Level K M1 L1–3, 22–26 Level K M2 L1–3, 9 Level K M3 L1–3, 14–16, 27–29 Level 1 M1 L1–3 Level 1 M2 L1–3 Level 1 M3 L1–3 Level 1 M4 L1–3, 14–16 Level 2 M1 L1–3 Level 2 M2 L1–2 Level 2 M3 L1–2 Level 2 M4 L1–3
Ask or identify questions that can be answered by an investigation.	Level K M1 L8–9 Level K M3 L4–8, 22 Level 2 M3 L3–6
SEP1.B.K–2: Defining Problems	**Aligned *PhD Science* Lessons**
Students define simple problems that can be solved through the development of a new or improved object or tool.	Level K M1 L4–7, 12–16 Level 1 M1 L11–15 Level 2 M3 L14–18

SEP2: Developing and Using Models

Standard SCI.SEP2: Students *develop and use models*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP2.K–2: Developing and Using Models Students use and develop models (i.e., diagrams, drawings, physical replicas, dioramas, dramatizations, or storyboards) that represent concrete events or design solutions. This includes the following:	**Aligned *PhD Science* Lessons**
Distinguish between a model and the actual object, process, or events the model represents.	Level K M1 L1–2, 12–16 Level K M2 L1–3, 10–12 Level 1 M1 L4–9, 18 Level 1 M3 L14 Level 2 M4 L4–6
Compare models to identify common features and differences.	Level 1 M1 L11–15 Level 1 M2 L1–3 Level 2 M4 L1–6, 20–21, 23–25
Develop or use models to represent amounts, relationships, relative scales (bigger, smaller), and patterns in the natural and designed world(s).	Level K M3 L1–3, 9–12, 19–20 Level K M4 L1–9, 11–16 Level 1 M1 L1–8, 28–29 Level 1 M2 L1–7, 10–23 Level 1 M3 L7, 11–13 Level 1 M4 L1–3, 7–8 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 K M1 L12–16 Level 1 M1 L11–15 Level 2 M3 L14–18

SEP3: Planning and Conducting Investigations

Standard SCI.SEP3: Students *plan and conduct investigations*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP3.K–2: Planning and Conducting Investigations Students plan and carry out simple investigations, based on fair tests, which provide data to support explanations or design solutions. This includes the following:	**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 measuring a phenomenon to determine which way can answer the question being studied.	Level K M4 L3–5 Level 2 M2 L3–4, 8–12, 22–24
Make observations (firsthand or from media) and 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 Level 1 M2 L4–12, 15–18, 22–23 Level 1 M3 L1–7, 11–13, 18–19 Level 1 M4 L4–6, 14–16, 19–21 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 observations (firsthand or from media) and measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.	Level K M1 L4–7, 12–20 Level K M2 L17–20 Level K M3 L21 Level 1 M3 L8–9, 20–25

SEP4: Analyzing and Interpreting Data

Standard SCI.SEP4: Students *analyze and interpret data*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP4.K–2: Analyzing and Interpreting Data Students collect, record, and share observations. This includes the following:	**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 Level 1 M1 L10 Level 2 M1 L4–7, 10–11, 14–18
Use and share pictures, drawings, or writings of observations.	Level K M2 L7–8 Level K M4 L1–2, 6–7, 10, 17, 20–24, 26–28
Use observations (firsthand or from media) to describe patterns or relationships in the natural and designed worlds in order to answer scientific questions and solve problems.	Level K M3 L4–8, 14–20, 22–26 Level K M4 L25 Level 1 M1 L16–21, 27–29 Level 1 M2 L1–9 Level 1 M3 L10 Level 1 M4 L4–6, 9–13 Level 2 M1 L4–11 Level 2 M2 L5–6, 8–9 Level 2 M3 L19–20 Level 2 M4 L22–25
Compare predictions (based on prior experiences) to what occurred (observable events).	Level K M4 L14–16 Level 1 M3 L11–13, 15–16, 26–29
Analyze data from tests of an object or tool to determine if the object or tool works as intended.	Level K M4 L20–24 Level 1 M3 L8–9 Level 2 M1 L20–22, 24–28 Level 2 M3 L14–18

SEP5: Using Mathematics and Computational Thinking

Standard SCI.SEP5: Students use *mathematics and computational thinking*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP5.K–2: Using Mathematics and Computational Thinking Students recognize that mathematics can be used to describe the natural and designed world. This includes the following:	**Aligned *PhD Science* Lessons**
Use counting and numbers to identify and describe patterns in the natural and designed worlds.	Level K M1 L17–21, 25–30 Level K M2 L17–20 Level 2 M4 L7–8, 20–22
Describe, measure, or compare quantitative attributes of different objects and display the data using simple graphs.	Level 2 M1 L20–22 Level 2 M3 L8–11, 23–29 Level 2 M4 L17–19
Use qualitative and/or quantitative data to compare two alternative solutions to a problem.	Level 1 M3 L21–25 Level 2 M2 L14–17

SEP6: Constructing Explanations and Designing Solutions

Standard SCI.SEP6: Students *construct explanations and design solutions*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP6.A.K–2: Constructing Explanations Students use evidence and ideas in constructing evidence-based accounts of natural phenomena. This includes the following:	**Aligned *PhD Science* Lessons**
Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena.	Level K M3 L4–16, 23–29 Level 1 M1 L1–9, 16–21, 27–29
SEP6.B.K–2: Designing Solutions Students use evidence and ideas in designing solutions. This includes the following:	**Aligned *PhD Science* Lessons**
Use tools and 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 Level 1 M1 L11–15 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
Generate and compare multiple solutions to a problem.	Level 1 M3 L21–25 Level 2 M2 L8–12, 14–17

SEP7: Engaging in Argument from Evidence

Standard SCI.SEP7: Students *engage in argument from evidence*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP7.K–2: Engaging in Argument from Evidence Students compare ideas and representations about the natural and designed world. This includes the following:	**Aligned *PhD Science* Lessons**
Identify arguments that are supported by evidence.	Level K M3 L17–18 Level 1 M4 L4–8, 23–25
Distinguish between explanations that account for all gathered evidence and those that do not.	Level 1 M3 L4–6 Level 1 M4 L14–18
Analyze why some evidence is relevant to a scientific question and some is not.	Level K M4 L25 Level 1 M4 L19–25 Level 2 M4 L20–21
Distinguish between opinions and evidence in one's own explanations.	Level K M3 L17–18 Level 1 M4 L9–13, 17, 27–28
Listen actively to arguments to indicate agreement or disagreement based on evidence or to retell the main points of the argument.	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
Construct an argument with evidence to support a claim.	Level K M3 L17–21, 27–29 Level K M4 L11–13, 27–28 Level 1 M4 L9–13, 19–21 Level 2 M2 L3–4, 10–13, 21–24 Level 2 M4 L16
Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.	Level 1 M3 L8–9, 18–20 Level 2 M3 L14–18, 21–22

SEP8: Obtaining, Evaluating, and Communicating Information

Standard SCI.SEP8: Students *obtain, evaluate, and communicate information*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP8.K–2: Obtaining, Evaluating, and Communicating Information Students use observations and texts to communicate new information. This includes the following:	**Aligned *PhD Science* Lessons**
Read developmentally appropriate texts or use media to obtain scientific and technical information. Use the information to determine patterns in or evidence about the natural and designed worlds.	Level K M4 L1–2, 6–10, 14–16, 18–19 Level 1 M1 L24–25 Level 1 M3 L18–19 Level 1 M4 L9–13 Level 2 M2 L1–2, 14–17
Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering 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 scientific questions or supporting scientific claims.	Level K M1 L25–26 Level K M3 L23–26 Level 2 M2 L5–6, 18–19 Level 2 M4 L4–9, 11–16, 23–25
Communicate information or design ideas and solutions with others in oral or written forms. Use models, drawings, writing, or numbers that provide detail about scientific ideas, practices, or design ideas.	Level K M1 L12–16, 28–30 Level K M2 L21–23 Level K M3 L27–29 Level K M4 L20–24, 26–28 Level 1 M1 L27–29 Level 1 M2 L21–23 Level 1 M3 L26–29 Level 1 M4 L23–25 Level 2 M1 L29–31 Level 2 M2 L22–24 Level 2 M3 L8–12, 14–20, 25–29 Level 2 M4 L23–25

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Disciplinary Core Ideas Level 3

The *PhD Science* Level 3 curriculum fully aligns with the Grade 3 WSS. A detailed analysis of alignment with disciplinary core ideas follows.

Key: Module (M), Lesson (L)

Grade 3 Disciplinary Core Ideas, Standards, Learning Priorities, and Performance Indicators

Life Science 1 (LS1)—Structures and Processes

Standard SCI.LS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *structures and processes (on a scale from molecules to organisms)* to make sense of phenomena and solve problems.

SCI.LS1.B.3: Growth and Development of Organisms	**Aligned *PhD Science* Lessons**
Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles.	Level 3 M3 L7–8, 23–28

Life Science 2 (LS2)—Interactions, Energy, and Dynamics Within Ecosystems

Standard SCI.LS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *the interactions, energy, and dynamics within ecosystems* to make sense of phenomena and solve problems.

SCI.LS2.C.3: Ecosystem Dynamics, Functioning, and Resilience	**Aligned *PhD Science* Lessons**
When the environment changes, some organisms survive and reproduce, some move to new locations, some move into transformed environments, and some die.	Level 3 M2 L16–28

SCI.LS2.D.3: Social Interactions and Group Behavior	**Aligned *PhD Science* Lessons**
Being part of a group helps animals obtain food, defend themselves, and cope with changes.	Level 3 M2 L13–15, 26–28

Life Science 3 (LS3)—Heredity

Standard SCI.LS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *heredity* to make sense of phenomena and solve problems.

SCI.LS3.A.3: Inheritance of Traits	**Aligned *PhD Science* Lessons**
Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment. Many characteristics involve both inheritance and environment.	Level 3 M3 L9–20, 26–28

SCI.LS3.B.3: Variation of Traits	**Aligned *PhD Science* Lessons**
Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops.	Level 3 M3 L1–6, 9–20, 23–28

Life Science 4 (LS4)—LS4 Biological Evolution

Standard SCI.LS4: Students use science and engineering practices, crosscutting concepts, and an understanding of *biological evolution* to make sense of phenomena and solve problems.

SCI.LS4.A.3: Evidence of Common Ancestry and Diversity	**Aligned *PhD Science* Lessons**
Some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago.	Level 3 M2 L1–8, 26–28

SCI.LS4.B.3: Natural Selection	**Aligned *PhD Science* Lessons**
Differences in characteristics between individuals of the same species provide advantages in surviving and reproducing.	Level 3 M3 L21–28

SCI.LS4.C.3: Adaptation	**Aligned *PhD Science* Lessons**
Particular organisms can only survive in particular environments.	Level 3 M2 L1–2, 9–12, 16–19, 22–28

SCI.LS4.D.3: Biodiversity and Humans	**Aligned *PhD Science* Lessons**
Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there.	Level 3 M2 L16–28

Physical Science 2 (P2S)—Forces, Interactions, Motion, and Stability

Standard SCI.PS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *forces, interactions, motion, and stability* to make sense of phenomena and solve problems.

SCI.PS2.A.3: Forces and Motion	**Aligned *PhD Science* Lessons**
Qualities of motion and changes in motion require description of both size and direction.	Level 3 M4 L10–18, 28–30
The effect of unbalanced forces on an object results in a change of motion.	Level 3 M4 L10–18, 28–30
Patterns of motion can be used to predict future motion.	Level 3 M4 L1–9, 28–30

SCI.PS2.B.3: Types of Interactions	
Some forces act through contact, some forces (e.g. magnetic, electrostatic) act even when the objects are not in contact.	Level 3 M4 L19–21, 28–30

Earth and Space Science 2 (ESS2)—Earth's Systems

Standard SCI.ESS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's systems* to make sense of phenomena and solve problems.

SCI.ESS2.D.3: Weather and Climate	**Aligned *PhD Science* Lessons**
Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed.	Level 3 M1 L11–15, 27–29

Earth and Space Science 3 (ESS3)—Earth and Human Activity

Standard SCI.ESS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth and human activity* to make sense of phenomena and solve problems.

SCI.ESS3.B.3: Natural Hazards	**Aligned *PhD Science* Lessons**
A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts.	Level 3 M1 L1–3, 16–29

Engineering, Technology, and the Application of Science 1 (ETS1)—Engineering Design

Standard SCI.ETS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *engineering design* to make sense of phenomena and solve problems.

SCI.ETS1.A.3–5: Defining and Delimiting Engineering Problems	**Aligned *PhD Science* Lessons**
Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	Level 3 M1 L21–26

SCI.ETS1.B.3–5: Developing Possible Solutions	**Aligned *PhD Science* Lessons**
Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 3 M1 L22–23
At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	Level 3 M2 L22–25
Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.	Level 3 M4 L23–27

Engineering, Technology, and the Application of Science 2 (ETS2)—Links Among Engineering, Technology, Science, and Society

Standard SCI.ETS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *links among engineering, technology, science, and society* to make sense of phenomena and solve problems.

SCI.ETS2.A.3–5: Interdependence of Science, Engineering, and Technology	**Aligned *PhD Science* Lessons**
Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 3 M1 L22–23

SCI.ETS2.B.3–5: Influence of Engineering, Technology, and Science on Society and the Natural World	**Aligned *PhD Science* Lessons**
People's needs and wants change over time, as do their demands for new and improved technologies.	Level 3 M1 L21–26
Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.	Level 3 M2 L22–25
When new technologies become available, they can bring about changes in the way people live and interact with one another.	Level 3 M4 L22–27

Engineering, Technology, and the Application of Science 3 (ETS3)—Nature of Science and Engineering

Standard SCI.ETS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *the nature of science and engineering* to make sense of phenomena and solve problems.

SCI.ETS3.A.3–5: Science and Engineering Are Human Endeavors	**Aligned *PhD Science* Lessons**
Science and engineering knowledge have been created by many cultures.	Level 3 M3 L16–18
People use the tools and practices of science and engineering in many different situations.	Level 3 M4 L15–16
Science and engineering affect everyday life.	Level 3 M1 L21–26

SCI.ETS3.B.3–5: Science and Engineering Are Unique Ways of Thinking with Different Purposes	**Aligned *PhD Science* Lessons**
Science and engineering are both bodies of knowledge and processes that add new knowledge to our understanding.	Level 3 M2 L22–25
Scientific findings are limited to what can be supported with evidence from the natural world.	Level 5 M3 L10–11 Level 5 M4 L5–8
Basic laws of nature are the same everywhere in the universe.	Level 5 M4 L9–12, 16–17
Engineering solutions often have drawbacks as well as benefits.	Level 3 M2 L20–21

SCI.ETS3.C.3–5: Science and Engineering Use Multiple Approaches to Create New Knowledge and Solve Problems	**Aligned *PhD Science* Lessons**
The products of science and engineering are not developed through one set “scientific method” or “engineering design process.” Instead, they use a variety of approaches described in the Science and Engineering Practices.	Level 3 M1 L21–26 Level 3 M2 L22–25 Level 3 M3 L12–13, 19-20 Level 3 M4 L23–27
Science explanations are based on a body of evidence and multiple tests and describe the mechanisms for natural events. Science explanations can change based on new evidence.	Level 3 M4 L12–14
There is no perfect design in engineering. Designs that are best in some ways (e.g., safety or ease of use) may be inferior in other ways (e.g., cost or aesthetics).	Level 3 M1 L21–26 Level 3 M2 L22–25 Level 3 M4 L23–27

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Three-Dimensional Performance Indicators Level 3

The *PhD Science* Level 3 curriculum fully aligns with the Grade 3 WSS. A detailed analysis of alignment with three-dimensional performance indicators follows.

Key: Module (M), Lesson (L)

Grade 3 Three-Dimensional Performance Indicators

Life Science (SCI.LS)

SCI.LS1	**Structures and Processes**	**Aligned *PhD Science* Lessons**
3-LS1-1	Develop models to describe that organisms have unique and diverse life cycles, but all have in common birth, growth, reproduction, and death.	Level 3 M3 L7–8, 23–28

SCI.LS2	**Interactions, Energy, and Dynamics Within Ecosystems**	**Aligned *PhD Science* Lessons**
3-LS2-1	Construct an argument that some animals form groups that help members survive.	Level 3 M2 L13–15, 26–28

SCI.LS3	**Heredity**	**Aligned *PhD Science* Lessons**
3-LS3-1	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Level 3 M3 L1–6, 14–18, 26–28
3-LS3-2	Use evidence to support the explanation that traits can be influenced by the environment.	Level 3 M3 L9–13, 19–20, 26–28

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

Physical Science (SCI.PS)

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

Earth and Space Science (SCI.ESS)

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

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

Engineering, Technology, and the Application of Science (SCI.ETS)

SCI.ETS1	Engineering Design	Aligned *PhD Science* Lessons
3–5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	Level 3 M1 L21–26
3–5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	Level 3 M2 L22–25
3–5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	Level 3 M4 L23–27

ETS3	Nature of Science and Engineering	Aligned *PhD Science* Lessons
3-ETS3-1	Obtain and evaluate information showing that different cultures have created different tools and technologies to survive in different types of environments.	Level 3 M2 L16–28

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Disciplinary Core Ideas Level 4

The *PhD Science* Level 4 curriculum fully aligns with the Grade 4 WSS. A detailed analysis of alignment with disciplinary core ideas follows.

Key: Module (M), Lesson (L)

Grade 4 Disciplinary Core Ideas, Standards, Learning Priorities, and Performance Indicators

Life Science 1 (LS1)—Structures and Processes

Standard SCI.LS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *structures and processes (on a scale from molecules to organisms)* to make sense of phenomena and solve problems.

SCI.LS1.A.4: Structure and Function	**Aligned *PhD Science* Lessons**
Plants and animals have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction.	Level 4 M3 L1–6, 20, 26–31

SCI.LS1.D.4: Information Processing	**Aligned *PhD Science* Lessons**
Different sense receptors are specialized for particular kinds of information; animals use their perceptions and memories to guide their actions.	Level 4 M3 L1–6, 15–25, 29–31

Physical Science 1 (PS1)—PS1 Matter and Its Interactions

Standard SCI.PS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *matter and its interactions* to make sense of phenomena and solve problems.

SCI.PS1.A.4: Structure and Function	**Aligned *PhD Science* Lessons**
Matter exists as particles that are too small to see. Matter is always conserved even if it seems to disappear. Measurements of a variety of observable properties can be used to identify particular materials.	Level 5 M1 L5–10, 23–26

Physical Science 3 (PS3)—PS3 Energy

Standard SCI.PS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *energy* to make sense of phenomena and solve problems.

SCI.PS3.A.4: Definitions of Energy	**Aligned *PhD Science* Lessons**
Moving objects contain energy. The faster the object moves, the more energy it has.	Level 4 M2 L6–9, 12–16, 24–26

SCI.PS3.B.4: Conservation of Energy and Energy Transfer	**Aligned *PhD Science* Lessons**
Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents. Energy can be converted from one form to another form.	Level 4 M2 L1–3, 10–11, 15–16, 24–26

SCI.PS3.C.4: Relationships Between Energy and Forces	**Aligned *PhD Science* Lessons**
When objects collide, contact forces transfer energy so as to change objects' motions.	Level 4 M2 L8–9, 24–26

SCI.PS3.D.4: Energy in Chemical Processes and Everyday Life	**Aligned *PhD Science* Lessons**
Plants capture energy from sunlight which can be used as fuel or food.	Level 5 M2 L6–7, 15–19, 24–26
Stored energy in food or fuel can be converted to useable energy.	Level 5 M2 L6–7, 15–19, 24–26

Physical Science 4 (PS4)—Waves and Their Applications in Technologies for Information Transfer

Standard SCI.PS4: Students use science and engineering practices, crosscutting concepts, and an understanding of *waves and their applications in technologies for information transfer* to make sense of phenomena and solve problems.

SCI.PS4.A.4: Wave Properties	**Aligned *PhD Science* Lessons**
Waves are regular patterns of motion, which can be made in water by disturbing the surface. Waves of the same type can differ in amplitude and wavelength. Waves can make objects move.	Level 4 M3 L7–14, 29–31

SCI.PS4.B.4: Electromagnetic Radiation	**Aligned *PhD Science* Lessons**
Objects can be seen when light reflected from their surface enters our eyes.	Level 4 M4 L1–17, 25–27

SCI.PS4.C.4: Information Technologies and Instrumentation	**Aligned *PhD Science* Lessons**
Patterns can encode, send, receive, and decode information.	Level 4 M4 L18–27

Earth and Space Science 1 (ESS1)—Earth's Place in the Universe

Standard SCI.ESS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's place in the universe* to make sense of phenomena and solve problems.

SCI.ESS1.C.4: The History of Planet Earth	**Aligned *PhD Science* Lessons**
Certain features on Earth can be used to order events that have occurred in a landscape.	Level 4 M1 L1–5, 19–20, 25–27

Earth and Space Science 2 (ESS2)—Earth's Systems

Standard SCI.ESS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's systems* to make sense of phenomena and solve problems.

SCI.ESS2.A.4: Earth Materials and Systems	**Aligned *PhD Science* Lessons**
Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around.	Level 4 M1 L6–11, 25–27

SCI.ESS2.B.4: Plate Tectonics and Large-Scale System Interactions	**Aligned *PhD Science* Lessons**
Earth's physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events.	Level 4 M1 L18–20, 25–27

SCI.ESS2.E.4: Biogeology	**Aligned *PhD Science* Lessons**
Living things can affect the physical characteristics of their environment.	Level 4 M1 L6–11, 25–27

Earth and Space Science 3 (ESS3)—Earth and Human Activity

Standard SCI.ESS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth and human activity* to make sense of phenomena and solve problems.

SCI.ESS3.A.4: Natural Resources	**Aligned *PhD Science* Lessons**
Energy and fuels humans use are derived from natural sources, and their use affects the environment. Some resources are renewable over time, others are not.	Level 4 M1 L21–27

SCI.ESS3.B.4: Natural Hazards	**Aligned *PhD Science* Lessons**
A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts.	Level 4 M1 L12–17, 25–27

Engineering, Technology, and the Application of Science (ETS1)—Engineering Design

Standard SCI.ETS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *engineering design* to make sense of phenomena and solve problems.

SCI.ETS1.A.3–5: Defining and Delimiting Engineering Problems	**Aligned *PhD Science* Lessons**
Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	Level 4 M2 L17–23

SCI.ETS1.B.3–5: Developing Possible Solutions	**Aligned *PhD Science* Lessons**
Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 4 M1 L12–17 Level 4 M4 L14–17
At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	Level 4 M1 L12–17 Level 4 M4 L14–17
Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.	Level 4 M1 L12–17 Level 4 M4 L14–17

SCI.ETS1.C.4: Optimizing the Design Solution	Aligned *PhD Science* Lessons
Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	Level 4 M4 L14–17

Engineering, Technology, and the Application of Science (ETS2)—Links Among Engineering, Technology, Science, and Society

Standard SCI.ETS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *links among engineering, technology, science, and society* to make sense of phenomena and solve problems.

SCI.ETS2.A.3–5: Interdependence of Science, Engineering, and Technology	Aligned *PhD Science* Lessons
Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 4 M1 L12–17 Level 4 M4 L14–17

SCI.ETS2.B.3–5: Influence of Engineering, Technology, and Science on Society and the Natural World	Aligned *PhD Science* Lessons
People's needs and wants change over time, as do their demands for new and improved technologies.	Level 4 M1 L23–24 Level 4 M2 L17–23
Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.	Level 4 M1 L12–17 Level 4 M2 L15–16 Level 4 M4 L14–17
When new technologies become available, they can bring about changes in the way people live and interact with one another.	Level 3 M4 L22–27

Engineering, Technology, and the Application of Science (ETS3)—Nature of Science and Engineering

Standard SCI.ETS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *the nature of science and engineering* to make sense of phenomena and solve problems.

SCI.ETS3.A.3–5: Science and Engineering Are Human Endeavors	**Aligned *PhD Science* Lessons**
Science and engineering knowledge have been created by many cultures.	Level 3 M3 L16–18
People use the tools and practices of science and engineering in many different situations (e.g., land managers, technicians, nurses and welders).	Level 3 M4 L15–16 Level 5 M4 L7–8
Science and engineering affect everyday life.	Level 4 M2 L1–3

SCI.ETS3.B.3–5: Science and Engineering Are Unique Ways of Thinking with Different Purposes	**Aligned *PhD Science* Lessons**
Science and engineering are both bodies of knowledge and processes that add new knowledge to our understanding.	Level 4 M1 L12–17 Level 4 M4 L22–24
Scientific findings are limited to what can be supported with evidence from the natural world.	Level 5 M3 L10–11 Level 5 M4 L5–8
Basic laws of nature are the same everywhere in the universe.	Level 5 M4 L9–12, 16–17
Engineering solutions often have drawbacks as well as benefits.	Level 4 M1 L22–24

SCI.ETS3.C.3–5: Science and Engineering Use Multiple Approaches to Create New Knowledge and Solve Problems	**Aligned *PhD Science* Lessons**
The products of science and engineering are not developed through one set “scientific method” or “engineering design process.” Instead, they use a variety of approaches described in the Science and Engineering Practices.	Level 4 M1 L12–17 Level 4 M2 L17–23 Level 4 M3 L15–19 Level 4 M4 L14–17
Science explanations are based on a body of evidence and multiple tests, and describe the mechanisms for natural events. Science explanations can change based on new evidence.	Level 3 M4 L12–14 Level 5 M2 L14 Level 5 M4 L1–2, 7–8, 13
There is no perfect design in engineering. Designs that are best in some ways (e.g., safety or ease of use) may be inferior in other ways (e.g., cost or aesthetics).	Level 4 M1 L12–17 Level 4 M2 L17–23 Level 4 M4 L14–17

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Three-Dimensional Performance Indicators Level 4

The *PhD Science* Level 4 curriculum fully aligns with the Grade 4 WSS. A detailed analysis of alignment with three-dimensional performance indicators follows.

Key: Module (M), Lesson (L)

Grade 4 Three-Dimensional Performance Indicators

Life Science (SCI.LS)

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

Physical Science (SCI.PS)

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

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

Earth and Space Science (SCI.ESS)

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

SCI.ESS2	Earth's Systems	Aligned *PhD Science* Lessons
4-ESS2-1	Make observations and measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	Level 4 M1 L6–11, 25–27
4-ESS2-2	Analyze and interpret data from maps to describe patterns of Earth's features.	Level 4 M1 L18–20, 25–27

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

Engineering, Technology, and the Application of Science (SCI.ETS)

SCI.ETS1	Engineering Design	Aligned *PhD Science* Lessons
3–5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	Level 4 M2 L17–23
3–5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	Level 4 M1 L12–17 Level 4 M4 L14–17
3–5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	Level 4 M4 L14–17

SCI.ETS3	Nature of Science and Engineering	Aligned *PhD Science* Lessons
4-ETS3-1	Construct an explanation for how energy is transferred in a system, and then revise that explanation based on new evidence.	Level 4 M2 L1–5, 8–26

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Disciplinary Core Ideas Level 5

The *PhD Science* Level 5 curriculum fully aligns with the Grade 5 WSS. A detailed analysis of alignment with disciplinary core ideas follows.

Key: Module (M), Lesson (L)

Grade 5 Disciplinary Core Ideas, Standards, Learning Priorities, and Performance Indicators

Life Science 1 (LS1)—Structures and Processes

Standard SCI.LS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *structures and processes (on a scale from molecules to organisms)* to make sense of phenomena and solve problems.

SCI.LS1.C.5: Organization for Matter and Energy Flow in Organisms	**Aligned *PhD Science* Lessons**
Food provides animals with the materials and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter, and obtain energy from sunlight, which is used to maintain conditions necessary for survival.	Level 5 M2 L3–5, 8–9, 15–19, 24–26

Life Science 2 (LS2)—Interactions, Energy, and Dynamics Within Ecosystems

Standard SCI.LS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *the interactions, energy, and dynamics within ecosystems* to make sense of phenomena and solve problems.

SCI.LS2.A.5: Interdependent Relationships in Ecosystems	**Aligned *PhD Science* Lessons**
The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.	Level 5 M2 L1–2, 8–14, 20, 24–26

SCI.LS2.B.5: Cycles of Matter and Energy Transfer in Ecosystems	**Aligned *PhD Science* Lessons**
Matter cycles between the air and soil and among organisms as they live and die.	Level 5 M2 L6–7, 10–14, 24–26

Physical Science 1 (PS1)—Matter and Its Interactions

Standard SCI.PS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *matter and its interactions* to make sense of phenomena and solve problems.

SCI.PS1.B.5: Chemical Reactions	**Aligned *PhD Science* Lessons**
Chemical reactions that occur when substances are mixed can be identified by the emergence of substances with different properties.	Level 5 M1 L1–2, 15–26
In chemical reactions the total mass remains the same.	Level 5 M1 L9–17, 23–26

Physical Science 2 (PS2)—Forces, Interactions, Motion and Stability

Standard SCI.PS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *forces, interactions, motion and stability* to make sense of phenomena and solve problems.

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

Physical Science 3 (PS3)—Energy

Standard SCI.PS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *energy* to make sense of phenomena and solve problems.

SCI.PS3.D.5: Energy in Chemical Processes and Everyday Life	**Aligned *PhD Science* Lessons**
Plants capture energy from sunlight which can be used as fuel or food.	Level 5 M2 L6–7, 15–19, 24–26
Stored energy in food or fuel can be converted to useable energy.	Level 5 M2 L6–7, 15–19, 24–26

Earth and Space Science 1 (ESS1)—Earth's Place in the Universe

Standard SCI.ESS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's place in the universe* to make sense of phenomena and solve problems.

SCI.ESS1.A.5: The Universe and Its Stars	**Aligned *PhD Science* Lessons**
Stars range greatly in size and distance from Earth, and this can explain their relative brightness.	Level 5 M4 L18–19, 24–26

SCI.ESS1.B.5: Earth and the Solar System	**Aligned *PhD Science* Lessons**
The Earth's orbit and rotation, and the orbit of the moon around the Earth cause observable patterns.	Level 5 M4 L1–2, 5–17, 20–26

Earth and Space Science 2 (ESS2)—Earth's Systems

Standard SCI.ESS2: Students use science and engineering practices, crosscutting concepts, and an understanding of *Earth's systems* to make sense of phenomena and solve problems.

SCI.ESS2.A.5: Earth Materials and Systems	**Aligned *PhD Science* Lessons**
Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around.	Level 5 M3 L1–13, 24–27

SCI.ESS2.C.5: The Roles of Water in Earth's Surface Processes	**Aligned *PhD Science* Lessons**
Most of Earth's water is in the ocean, and much of the Earth's freshwater is in glaciers or underground.	Level 5 M3 L4–5, 24–27

Earth and Space Science 3 (ESS3)—Earth and Human Activity

Standard SCI.ESS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *the Earth and human activity* to make sense of phenomena and solve problems.

SCI.ESS3.C.5: Human Impacts on Earth Systems	**Aligned *PhD Science* Lessons**
Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments.	Level 5 M3 L14–27

Engineering, Technology, and the Application of Science 1 (ETS1)—Engineering Design

Standard SCI.ETS1: Students use science and engineering practices, crosscutting concepts, and an understanding of *engineering design* to make sense of phenomena and solve problems.

SCI.ETS1.A.3–5: Defining and Delimiting Engineering Problems	**Aligned *PhD Science* Lessons**
Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	Level 5 M2 L21–23

SCI.ETS1.B.3–5: Developing Possible Solutions	**Aligned *PhD Science* Lessons**
Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 5 M3 L19–23
At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	Level 5 M2 L21–23 Level 5 M3 L19–23
Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.	Level 5 M1 L18–22

Engineering, Technology, and the Application of Science 2 (ETS2)—Links Among Engineering, Technology, Science, and Society

Standard SCI.ETS2: Students use science and engineering practices, crosscutting concepts, and an understanding *of links among engineering, technology, science, and society* to make sense of phenomena and solve problems.

SCI.ETS2.A.3–5: Interdependence of Science, Engineering, and Technology	**Aligned *PhD Science* Lessons**
Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.	Level 5 M3 L19–23

SCI.ETS2.B.3–5: Influence of Engineering, Technology, and Science on Society and the Natural World	**Aligned *PhD Science* Lessons**
People's needs and wants change over time, as do their demands for new and improved technologies.	Level 5 M2 L21–23
Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.	Level 5 M2 L21–23 Level 5 M3 L19–23
When new technologies become available, they can bring about changes in the way people live and interact with one another.	Level 3 M4 L22–27

Engineering, Technology, and the Application of Science 3 (ETS3)—Nature of Science and Engineering

Standard SCI.ETS3: Students use science and engineering practices, crosscutting concepts, and an understanding of *the nature of science and engineering* to make sense of phenomena and solve problems.

SCI.ETS3.A.3–5: Science and Engineering Are Human Endeavors	**Aligned *PhD Science* Lessons**
Science and engineering knowledge have been created by many cultures.	Level 3 M3 L16–18
People use the tools and practices of science and engineering in many different situations.	Level 5 M4 L7–8
Science and engineering affect everyday life.	Level 3 M1 L21–26 Level 4 M2 L1–3

SCI.ETS3.B.3–5: Science and Engineering Are Unique Ways of Thinking with Different Purposes	**Aligned *PhD Science* Lessons**
Science and engineering are both bodies of knowledge and processes that add new knowledge to our understanding.	Level 5 M1 L18–22 Level 5 M2 L21–23 Level 5 M3 L19–23
Scientific findings are limited to what can be supported with evidence from the natural world.	Level 5 M3 L10–11 Level 5 M4 L5–8
Basic laws of nature are the same everywhere in the universe.	Level 5 M4 L9–12, 16–17
Engineering solutions often have drawbacks as well as benefits.	Level 5 M3 L14–18

SCI.ETS3.C.3–5: Science and Engineering Use Multiple Approaches to Create New Knowledge and Solve Problems	**Aligned *PhD Science* Lessons**
The products of science and engineering are not developed through one set “scientific method” or “engineering design process.” Instead, they use a variety of approaches described in the Science and Engineering Practices.	Level 5 M1 L18–22 Level 5 M2 L21–23 Level 5 M3 L19–23 Level 5 M4 L9–12
Science explanations are based on a body of evidence and multiple tests, and describe the mechanisms for natural events. Science explanations can change based on new evidence.	Level 5 M2 L14 Level 5 M4 L1–2, 7–8, 13
There is no perfect design in engineering. Designs that are best in some ways (e.g. safety or ease of use) may be inferior in other ways (e.g. cost or aesthetics).	Level 5 M1 L18–22 Level 5 M2 L21–23 Level 5 M3 L19–23

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Three-Dimensional Performance Indicators Level 5

The *PhD Science* Level 5 curriculum fully aligns with the Grade 5 WSS. A detailed analysis of alignment with three-dimensional performance indicators follows.

Key: Module (M), Lesson (L)

Grade 5 Three-Dimensional Performance Indicators

Life Science (SCI.LS)

SCI.LS1	**Structures and Processes**	**Aligned *PhD Science* Lessons**
5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.	Level 5 M2 L3–5, 24–26

SCI.LS2	**Interactions, Energy, and Dynamics Within Ecosystems**	**Aligned *PhD Science* Lessons**
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	Level 5 M2 L1–2, 6–14, 20, 24–26

Physical Science (SCI.PS)

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

SCI.PS2	Forces, Interactions, Motion, and Stability	Aligned *PhD Science* Lessons
5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.	Level 5 M4 L3–4, 24–26

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

Earth and Space Science (SCI.ESS)

SCI.ESS1	Earth's Place in the Universe	Aligned *PhD Science* Lessons
5-ESS1-1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	Level 5 M4 L18–19, 24–26
5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	Level 5 M4 L1–2, 5–17, 20–26

SCI.ESS2	Earth's Systems	Aligned *PhD Science* Lessons
5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and atmosphere interact.	Level 5 M3 L1–3, 6–13, 19–27
5-ESS2-2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	Level 5 M3 L4–5, 19–27

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

Engineering, Technology, and the Application of Science (SCI.ETS)

SCI.ETS1	Engineering Design	Aligned *PhD Science* Lessons
3–5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	Level 5 M2 L21–23
3–5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	Level 5 M3 L19–23
3–5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	Level 5 M1 L18–22

ETS3	Nature of Science and Engineering	Aligned *PhD Science* Lessons
5-ETS3-1	Investigate properties of materials to provide evidence as to which would best work within an engineering design solution.	Level 5 M1 L1–17, 23–26

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Crosscutting Concepts 3–5

The *PhD Science* Levels 3–5 curriculum fully aligns with the WSS 3–5 crosscutting concepts standards. A detailed analysis of alignment follows.

Key: Module (M), Lesson (L)

3–5 Grade Band Crosscutting Concepts Standards, Learning Priorities, and Performance Indicators

CC1: Patterns

Standard SCI.CC1: Students use science and engineering practices, disciplinary core ideas, and *patterns* to make sense of phenomena and solve problems.

SCI.CC1.3–5	**Aligned *PhD Science* Lessons**
Students identify similarities and differences in order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and use these patterns to make predictions.	Level 3 M1 L11–15, 19–20, 27–29 Level 3 M2 L3–8, 13–15, 27–28 Level 3 M3 L1–8, 14–18, 26–28 Level 3 M4 L1–9, 28–30 Level 4 M1 L1–5, 18–20, 26–27 Level 4 M2 L4–5, 8–11, 24–26 Level 4 M3 L1–3, 7–11, 20, 24–31 Level 4 M4 L1–4, 7–8, 14–17, 22–27 Level 5 M1 L7–8 Level 5 M2 L1–5, 8–9, 15–17, 25–26 Level 5 M3 L6–9 Level 5 M4 L1–17, 20–26

CC2: Cause and Effect

Standard SCI.CC2: Students use science and engineering practices, disciplinary core ideas, and *cause and effect* relationships to make sense of phenomena and solve problems.

SCI.CC2.3–5	**Aligned *PhD Science* Lessons**
Students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity may or may not signify a cause and effect relationship.	Level 3 M1 L1–3, 16–18, 21–29 Level 3 M2 L9–12, 16–28 Level 3 M3 L9–13, 19–25, 27–28 Level 3 M4 L1–3, 10–30 Level 4 M1 L6–17, 21–27 Level 4 M2 L1–7, 10–14, 24–26 Level 4 M3 L6–23, 30–31 Level 4 M4 L3–13, 18–21, 25–27 Level 5 M1 L1–2, 5–6, 9–10, 18–22, 24–26 Level 5 M2 L3–7, 12–13, 18–23, 25–26 Level 5 M3 L6–8, 12–18, 25–27 Level 5 M4 L5–6, 24–26

CC3: Scale, Proportion, and Quantity

Standard SCI.CC3: Students use science and engineering practices, disciplinary core ideas, and an understanding of *scale, proportion, and quantity* to make sense of phenomena and solve problems.

SCI.CC3.3–5	**Aligned *PhD Science* Lessons**
Students recognize natural objects and observable phenomena exist from the very small to the immensely large. They use standard units to measure and describe physical quantities such as mass, time, temperature, and volume.	Level 3 M1 L4–10 Level 3 M2 L1–2, 27–28 Level 3 M3 L1–3, 14–15 Level 4 M1 L3–5 Level 5 M1 L3–4, 13–17, 23–26 Level 5 M2 L10–11 Level 5 M3 L1–5, 10–11, 24–27 Level 5 M4 L18–19, 24–26

CC4: Systems and System Models

Standard SCI.CC4: Students use science and engineering practices, disciplinary core ideas, and an understanding of *systems and system models* to make sense of phenomena and solve problems.

SCI.CC4.3–5	**Aligned *PhD Science* Lessons**
Students understand a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They also describe a system in terms of its components and their interactions.	Level 3 M1 L1–3, 16–20 Level 3 M2 L6–15, 20–28 Level 3 M3 L9–11 Level 3 M4 L1–30 Level 4 M1 L1–2, 12–17, 21–24 Level 4 M2 L1–11, 15–26 Level 4 M3 L7–9, 15–19, 21–23, 26–28, 30–31 Level 4 M4 L1–6, 10–27 Level 5 M1 L3–4, 15–17 Level 5 M2 L1–2, 6–11, 14, 18–19, 24–26 Level 5 M3 L1–9, 12–13, 19–27 Level 5 M4 L1–2, 7–26

CC5: Energy and Matter

Standard SCI.CC5: Students use science and engineering practices, disciplinary core ideas, and an understanding of *energy and matter* to make sense of phenomena and solve problems.

SCI.CC5.3–5	**Aligned *PhD Science* Lessons**
Students understand matter is made of particles and energy can be transferred in various ways and between objects. Students observe the conservation of matter by tracking matter flows and cycles before and after processes, recognizing the total mass of substances does not change.	Level 4 M2 L1–3, 8–26 Level 4 M3 L10–19, 30–31 Level 5 M1 L5–8, 13–14, 23–26 Level 5 M2 L6–11, 14–19, 24–26 Level 5 M3 L10–11 Level 5 M4 L3–4

CC6: Structure and Function

Standard SCI.CC6: Students use science and engineering practices, disciplinary core ideas, and an understanding of *structure and function* to make sense of phenomena and solve problems.

SCI.CC6.3–5	**Aligned *PhD Science* Lessons**
Students understand different materials have different substructures, which can sometimes be observed; and substructures have shapes and parts that serve functions.	Level 3 M2 L1–3, 9–12 Level 3 M3 L4–6, 21–28 Level 4 M3 L4–6, 20, 24–25, 29–31 Level 4 M4 L7–9, 25–27

CC7: Stability and Change

Standard SCI.CC7: Students use science and engineering practices, disciplinary core ideas, and an understanding of *stability and change* to make sense of phenomena and solve problems.

SCI.CC7.3–5	**Aligned *PhD Science* Lessons**
Students measure change in terms of differences over time, and observe that change may occur at different rates. They understand some systems appear stable, but over long periods of time they will eventually change.	Level 3 M1 L4–15, 27–29 Level 3 M2 L16–19 Level 3 M3 L7–8, 12–13, 19–20, 26–28 Level 4 M1 L3–11, 18–20, 25–27 Level 5 M1 L1–2, 9–12, 18–26 Level 5 M2 L12–13, 20, 24–26 Level 5 M3 L14–18 Level 5 M4 L5–6, 9–12, 24–26

PhD Science® Correlation to the Wisconsin Standards for Science (WSS): Science and Engineering Practices 3–5

The *PhD Science* Level 3–5 curriculum fully aligns with the WSS 3–5 science and engineering practices standards. A detailed analysis of alignment follows.

Key: Module (M), Lesson (L)

3–5 Grade Band Science and Engineering Standards, Learning Priorities, and Performance Indicators

SEP1: Asking Questions and Defining Problems

Standard SCI.SEP1: Students *ask questions and define problems*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP1.A.3–5: Asking Questions Students ask questions that specify qualitative relationships. This includes the following:	**Aligned *PhD Science* Lessons**
Ask questions about what would happen if a variable is changed.	Level 4 M3 L15–19
Identify scientific (testable) and non-scientific (non-testable) questions.	Level 3 M3 L12–13 Level 3 M4 L15–16, 19–21
Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.	Level 3 M1 L1–3 Level 3 M2 L1–2 Level 3 M3 L1–3 Level 3 M4 L1–3, 7–9, 28–30 Level 4 M1 L1–2, 23 Level 4 M2 L1–3, 8–9, 11, 25–26 Level 4 M3 L1–3, 6 Level 4 M4 L1–2 Level 5 M1 L1–2 Level 5 M2 L1–2 Level 5 M3 L1–3 Level 5 M4 L1–2, 13

SEP1.B.3–5: Defining Problems	Aligned *PhD Science* Lessons
Students use prior knowledge to describe and define simple design problems that can be solved through the development of an object, tool, process, or system. They include several criteria for success and constraints on materials, time, or cost.	Level 3 M1 L21–26, 28–29 Level 3 M4 L22–27, 29–30 Level 4 M1 L12–17 Level 4 M2 L17–23 Level 4 M4 L14–17 Level 5 M3 L19–23
Students define simple problems that can be solved through the development of a new or improved object or tool.	Level 3 M1 L21–26, 28–29 Level 3 M4 L23–27 Level 4 M1 L12–17 Level 4 M2 L17–23 Level 4 M4 L14–17 Level 5 M2 L21–23

SEP2: Developing and Using Models

Standard SCI.SEP2: Students *develop and use models*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP2.A.3–5: Developing and Using Models Students build and revise simple models and use models to represent events and design solutions. This includes the following:	Aligned *PhD Science* Lessons
Identify limitations of models.	Level 4 M4 L14–17, 26–27 Level 5 M1 L5–6 Level 5 M2 L14 Level 5 M3 L6–8, 25–27
Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.	Level 4 M2 L15–16 Level 4 M4 L3–8, 10–13 Level 5 M1 L5–6 Level 5 M2 L1–2, 6–7 Level 5 M4 L1–2, 7–8, 14–17

SCI.SEP2.A.3–5: Developing and Using Models Students build and revise simple models and use models to represent events and design solutions. This includes the following:	**Aligned *PhD Science* Lessons**
Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.	Level 3 M1 L1–3 Level 3 M2 L1–3, 6–8, 27–28 Level 4 M1 L1–2, 26–27 Level 4 M2 L1–3, 8–11, 25–26 Level 4 M3 L1–3, 7–14, 30–31 Level 4 M4 L1–2 Level 5 M1 L7–8 Level 5 M2 L20, 25–26 Level 5 M3 L6–8, 10–11, 24–27 Level 5 M4 L3–4, 24–26
Develop and/or use models to describe or predict phenomena.	Level 3 M1 L1–3, 19–20 Level 3 M2 L9–12, 27–28 Level 3 M3 L7–11, 21–25, 27–28 Level 3 M4 L1–3, 17–18, 28–30 Level 4 M1 L1–2, 26–27 Level 4 M2 L1–3, 8–9, 25–26 Level 4 M3 L1–3 Level 4 M4 L1–6 Level 5 M1 L1–2, 9–10, 13–14, 23–26 Level 5 M2 L1–2, 6–7, 14 Level 5 M3 L1–3, 9, 12–16, 25–27 Level 5 M4 L13, 20–26

SCI.SEP2.A.3–5: Developing and Using Models Students build and revise simple models and use models to represent events and design solutions. This includes the following:	**Aligned *PhD Science* Lessons**
Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.	Level 3 M2 L22–25 Level 3 M4 L23–27 Level 4 M1 L1–2, 26–27 Level 4 M2 L1–3, 8–9, 25–26 Level 4 M3 L1–3 Level 4 M4 L1–6 Level 5 M3 L19–23
Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.	Level 4 M3 L7–11 Level 4 M4 L10–13, 18–24 Level 5 M3 L12–13 Level 5 M4 L9–12

SEP3: Planning and Conducting Investigations

Standard SCI.SEP3: Students *plan and conduct investigations*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP3.A.3–5: Planning and Conducting Investigations Students plan and carry out investigations that control variables and provide evidence to support explanations or design solutions. This includes the following:	**Aligned *PhD Science* Lessons**
Collaboratively plan and conduct an investigation to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	Level 3 M4 L7–9, 15–16, 23–27, 29–30 Level 4 M1 L8–11 Level 4 M2 L6–7 Level 4 M3 L15–19 Level 4 M4 L7–8, 18–21 Level 5 M1 L18–22 Level 5 M2 L3–5 Level 5 M4 L25–26
Evaluate appropriate methods and tools for collecting data.	Level 3 M3 L12–13 Level 4 M4 L7–8 Level 5 M2 L3–5
Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.	Level 3 M2 L4–5 Level 3 M4 L7–18, 29–30 Level 4 M1 L6–11, 21–22 Level 4 M2 L10–14 Level 4 M3 L15–19 Level 4 M4 L9, 26–27 Level 5 M1 L13–14, 24–26 Level 5 M3 L10–11 Level 5 M4 L18–19
Make predictions about what would happen if a variable changes.	Level 3 M3 L12–13 Level 3 M4 L7–9, 15–16, 28–30 Level 5 M4 L5–6
Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.	Level 4 M4 L14–17

SEP4: Analyzing and Interpreting Data

Standard SCI.SEP4: Students *analyze and interpret data*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP4.A.3–5: Analyzing and Interpreting Data Students begin to use quantitative approaches to collect data and conduct multiple trials of qualitative observations. (When possible, digital tools should be used.) This includes the following:	**Aligned *PhD Science* Lessons**
Represent data in tables or various graphical displays (bar graphs, pictographs, and pie charts) to reveal patterns that indicate relationships.	Level 3 M1 L4–12 Level 3 M3 L7–8, 27–28 Level 3 M4 L4–9 Level 5 M2 L3–5, 10–11 Level 5 M3 L4–5, 14–16 Level 5 M4 L14–15
Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, or computation.	Level 3 M1 L11–15, 19–20, 27–29 Level 3 M2 L3–8, 16–19, 27–28 Level 3 M3 L4–6, 14–18, 27–28 Level 4 M1 L12–20, 23–24, 26–27 Level 4 M2 L25–26 Level 4 M4 L10–13 Level 5 M1 L15–17, 24–26 Level 5 M2 L8–9, 12–13, 15–17, 25–26 Level 5 M3 L4–5, 25–27
Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.	Level 3 M3 L14–15, 19–20 Level 3 M4 L7–9 Level 5 M3 L14–16
Analyze data to refine a problem statement or the design of a proposed object, tool, or process.	Level 4 M4 L14–17
Use data to evaluate and refine design solutions.	Level 4 M4 L14–17

SEP5: Using Mathematics and Computational Thinking

Standard SCI.SEP5: Students use *mathematics and computational thinking*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP5.A.3–5: Using Mathematics and Computational Thinking Students extend quantitative measurements to a variety of physical properties, using computation and mathematics to analyze data and compare alternative design solutions. This includes the following:	**Aligned *PhD Science* Lessons**
Organize simple data sets to reveal patterns that suggest relationships.	Level 3 M1 L4–12 Level 3 M2 L3, 16–19 Level 3 M3 L7–8 Level 5 M4 L25–26
Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.	Level 3 M3 L7–8 Level 4 M2 L8–9 Level 5 M1 L3–4, 15–17 Level 5 M3 L10–11, 24–27
Create and use graphs or charts generated from simple algorithms to compare alternative solutions to an engineering problem.	Level 4 M4 L14–17

SEP6: Constructing Explanations and Designing Solutions

Standard SCI.SEP6: Students *construct explanations and design solutions*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SEP6.A.3–5: Constructing Explanations Students use evidence to construct explanations that specify variables which describe and predict phenomena. This includes the following:	**Aligned *PhD Science* Lessons**
Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).	Level 3 M2 L6–8 Level 3 M3 L26–28 Level 3 M4 L10–14 Level 4 M1 L6–7, 26–27 Level 4 M2 L25–26 Level 4 M3 L30–31 Level 4 M4 L18–21, 26–27 Level 5 M2 L12–13, 25–26 Level 5 M4 L22–26
Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation.	Level 3 M1 L13–15, 18 Level 3 M2 L6–8, 26–28 Level 3 M3 L9–11, 14–15, 21–28 Level 3 M4 L10–14, 19–21, 28–30 Level 4 M1 L3–5, 25–27 Level 4 M2 L4–5, 15–16, 24–26 Level 4 M3 L4–5, 24–25, 29–31 Level 4 M4 L25–27 Level 5 M1 L5–6, 23–26 Level 5 M2 L15–17, 24–26 Level 5 M3 L17–18, 25–27 Level 5 M4 L24–26

SEP6.A.3–5: Constructing Explanations Students use evidence to construct explanations that specify variables which describe and predict phenomena. This includes the following:	**Aligned *PhD Science* Lessons**
Identify the evidence that supports particular points in an explanation.	Level 3 M2 L26–28 Level 3 M3 L26–28 Level 3 M4 L28–30 Level 4 M1 L3–5, 10, 18, 21–22, 25–27 Level 5 M1 L11–12, 23–26 Level 5 M2 L24–26 Level 5 M4 L20–21, 24–26

SEP6.B.3–5: Designing Solutions Students use evidence to create multiple solutions to design problems. This includes the following:	**Aligned *PhD Science* Lessons**
Apply scientific ideas to solve design problems.	Level 3 M2 L22–25 Level 3 M4 L28–30 Level 4 M2 L17–23 Level 4 M4 L14–17, 26–27 Level 5 M4 L9–12
Generate multiple solutions to a problem and compare how well they meet the criteria and constraints.	Level 3 M1 L21–29 Level 3 M2 L22–25 Level 4 M1 L12–17 Level 4 M4 L14–17, 22–24 Level 5 M1 L18–22 Level 5 M2 L21–23 Level 5 M3 L19–23 Level 5 M4 L3–4

SEP7: Engaging in Argument from Evidence

Standard SCI.SEP7: Students *engage in argument from evidence*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP7.A.3–5: Engaging in Argument from Evidence Students critique the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world. This includes the following:	**Aligned *PhD Science* Lessons**
Compare and refine arguments based on an evaluation of the evidence presented.	Level 3 M3 L16–18 Level 4 M3 L21–23 Level 4 M4 L7–8
Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.	Level 5 M4 L5–6
Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.	Level 4 M3 L21–23 Level 5 M2 L3–5, 21–23, 25–26
Construct and/or support an argument with evidence, data, or a model.	Level 3 M2 L9–15, 27–28 Level 3 M3 L16–18 Level 4 M3 L21–23, 26–28, 30–31 Level 5 M1 L3–4, 24–26 Level 5 M2 L3–5, 8–11, 25–26 Level 5 M3 L25–27 Level 5 M4 L13–17, 20–21, 24–26
Use data to evaluate claims about cause and effect.	Level 3 M3 L19–20 Level 3 M4 L12–14 Level 5 M4 L24–26
Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	Level 3 M1 L21–26, 28–29 Level 3 M2 L20–21 Level 5 M3 L19–23

SEP8: Obtaining, Evaluating, and Communicating Information

Standard SCI.SEP8: Students *obtain, evaluate, and communicate information*, in conjunction with using crosscutting concepts and disciplinary core ideas, to make sense of phenomena and solve problems.

SCI.SEP8.3–5: Obtaining, Evaluating, and Communicating Information Students evaluate the merit and accuracy of ideas and methods. This includes the following:	**Aligned *PhD Science* Lessons**
Read and comprehend grade-appropriate complex texts and other reliable media to summarize and obtain scientific and technical ideas, and describe how they are supported by evidence.	Level 3 M2 L13–15 Level 3 M4 L22 Level 4 M1 L3–5 Level 4 M3 L30–31 Level 4 M4 L22–24 Level 5 M2 L10–11, 18–19, 25–26
Compare and/or combine information across complex texts and other reliable media to support the engagement in scientific and engineering practices.	Level 3 M2 L13–15 Level 5 M2 L6–7, 20 Level 5 M3 L25–27
Combine information in written text with that contained in corresponding tables, diagrams, or charts to support the engagement in other scientific and engineering practices.	Level 5 M4 L18–19
Obtain and combine information from books or other reliable media to explain phenomena or solutions to a design problem.	Level 3 M1 L11–17, 28–29 Level 4 M1 L3–5, 23–24 Level 4 M3 L4–6, 10–11, 20–23, 26–28 Level 5 M3 L9, 14–16, 19–27
Communicate scientific and technical information orally or in written formats, including various forms of media, which may include tables, diagrams, and charts.	Level 3 M2 L20–21 Level 4 M1 L23–24