South Dakota Science Standards Correlation to *PhD Science*™

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

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

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

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

Key: Module (M), Lesson (L)

PhD Science Level 3

The Grade 3 South Dakota Science Standards are fully covered by the Level 3 *PhD Science* curriculum. A detailed analysis of alignment appears in the table below.

Grade 3 Standards			**Aligned *PhD Science* Lessons**
Physical Science			
Motion and Stability: Forces and Interactions			
3-PS2-1	Plan and carry out an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.		Level 3 M4 L10–L18 Level 3 M4 L28–L30
3-PS2-2	Make observations and/or measurements of an object's motion to provide evidence for how a pattern can be used to predict future motion.		Level 3 M4 L1–L9 Level 3 M4 L28–L30
3-PS2-3	Ask questions about cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.		Level 3 M4 L19–L21 Level 3 M4 L28–L30
3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.		Level 3 M4 L22–L30
Life Science			
From Molecules to Organisms: Structures and Processes			
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–L8 Level 3 M3 L23–L28
Ecosystems: Interactions, Energy, and Dynamics			
3-LS2-1	Construct an argument that some animals form groups that help members survive.		Level 3 M2 L13–L15 Level 3 M2 L26–L28
Heredity: Inheritance and Variation of Traits			
3-LS3-1	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variations of these traits exist in a group of similar organisms.		Level 3 M3 L1–L6 Level 3 M3 L14–L18 Level 3 M3 L26–L28
3-LS3-2	Use evidence and reasoning to support the explanation that traits can be influenced by the environment.		Level 3 M3 L9–L13 Level 3 M3 L19–L20 Level 3 M3 L26–L28

Biological Unity and Diversity			
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–L8 Level 3 M2 L26–L28
3-LS4-2	Use evidence and reasoning 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–L28
3-LS4-3	Construct an argument with evidence how some organisms thrive, some struggle to survive, and some cannot survive in a particular habitat.		Level 3 M2 L1–L2 Level 3 M2 L9–L12 Level 3 M2 L16–L19 Level 3 M2 L22–L28
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–L28
Earth and Space Science			
Earth's Systems			
3-ESS2-1	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.		Level 3 M1 L1–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29
3-ESS2-2	Obtain and combine information to describe climates in different regions of the world.		Level 3 M1 L11–L15 Level 3 M1 L27–L29
Earth and Human Activity			
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–L3 Level 3 M1 L16–L29
Engineering Design			
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–L26 Level 3 M4 L23–L27
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–L17 Level 5 M3 L19–L23
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 M2 L23–L27 Level 3 M4 L23–L27

Science and Engineering Practices			**Aligned *PhD Science* Lessons**
1	Asking Questions and Defining Problems • Ask questions about what would happen if a variable is changed. • Identify scientific (testable) and nonscientific (non-testable) questions. • Ask questions that can be investigated and predict reasonable outcomes based on patterns, such as cause and effect relationships. • Use prior knowledge to describe problems that can be solved. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.		Level 3 M1 L1–L3 Level 3 M1 L21–L26 Level 3 M2 L1–L2 Level 3 M3 L1–L3 Level 3 M3 L12–L13 Level 3 M4 L1–L3 Level 3 M4 L7–L9 Level 3 M4 L15–L16 Level 3 M4 L19–L30
3	Planning and Carrying Out Investigations		Level 3 M2 L4–L5 Level 3 M3 L12–L13 Level 3 M4 L7–L18

	• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.		Level 3 M4 L23–L30
4	Analyzing and Interpreting Data • Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.		Level 3 M1 L4–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29 Level 3 M2 L3–L8 Level 3 M2 L16–L19 Level 3 M3 L4–L8 Level 3 M3 L14–L20 Level 3 M4 L4–L9
6	Constructing Explanations and Designing Solutions • Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard). • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Apply scientific ideas to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.		Level 3 M1 L13–L15 Level 3 M1 L18 Level 3 M1 L21–L29 Level 3 M2 L6–L8 Level 3 M2 L22–L28 Level 3 M3 L9–L11 Level 3 M3 L14–L15 Level 3 M3 L21–L28 Level 3 M4 L10–L14 Level 3 M4 L19–L21 Level 3 M4 L28–L30
7	Engaging in Argument from Evidence • Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • 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–L26 Level 3 M2 L9–L15 Level 3 M2 L20–L21 Level 3 M3 L16–L20 Level 3 M4 L10–L14
8	Obtaining, Evaluating, and Communicating Information • Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support an investigation or design.		Level 3 M1 L16–L17 Level 3 M2 L13–L15 Level 3 M2 L20–L21 Level 3 M4 L22

	• Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.		

Disciplinary Core Ideas			**Aligned *PhD Science* Lessons**
PS2.A	**Forces and Motion**		
	Using observation and measurement to determine the affect of balanced and unbalanced forces on an objects motion, and to determine its future motion.		Level 3 M4 L10–L18 Level 3 M4 L28–L30
PS2.B	**Types of Interactions**		
	Using scientific ideas to ask questions and conduct investigations about cause and effect relationships pertaining to gravitational, electric, and magnetic interactions.		Level 3 M4 L19–L30
LS1.B	**Growth and Development of Organisms**		
	Developing models to describe both common and unique life cycle processes in different organisms.		Level 3 M3 L7–L8 Level 3 M3 L23–L28
LS2.C	**Ecosystem Dynamics, Functioning, and Resilience**		
	Using evidence and reasoning to describe how certain characteristics of the same species and different species within an ecosystem may provide advantages in survival, mating, and reproduction.		Level 3 M2 L16–L28
LS2.D	**Social Interactions and Group Behavior**		
	Making arguments about how some animals form groups to help members survive.		Level 3 M2 L13–L15 Level 3 M2 L22–L28
LS3.A	**Inheritance of Traits**		
	Using data to provide evidence of inherited traits in plants and animals.		Level 3 M3 L14–L18 Level 3 M3 L26–L28
LS3.B	**Variation of Traits**		
	Using data to provide evidence of variable traits in plants and animals. Understanding that traits can be influenced by both inheritance and environment.		Level 3 M3 L1–L18 Level 3 M3 L23–L28
LS4.A	**Evidence of Common Ancestry and Diversity**		
	Analyzing data to describe organisms and environments that existed long ago.		Level 3 M2 L1–L5 Level 3 M2 L26–L28
LS4.B	**Natural Selection**		
	Using evidence and reasoning to describe how certain characteristics of the same species may provide advantages in survival, mating, and reproduction.		Level 3 M3 L21–L28
LS4.C	**Adaptation**		
	Explaining the impact that habitat, genetic inheritance, and ability to adapt can have on an organism's chances of survival. Understanding		Level 3 M2 L1–L2 Level 3 M2 L9–L12 Level 3 M2 L16–L19

	that plants and animals might change as a result of changes in the environment.		Level 3 M2 L22–L28
LS4.D	**Biodiversity and Humans**		
	Explaining why different members of the same species might have similar or different characteristics.		Level 3 M2 L16–L21 Level 3 M2 L26–L28
ESS2.D	**Weather and Climate**		
	Using data to describe weather patterns during specific seasons, and in specific climates throughout the world.		Level 3 M1 L1–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29
ESS3.B	**Natural Hazards**		
	Providing a design solution that protects against severe weather-related hazards.		Level 3 M1 L1–L3 Level 3 M1 L16–L29

Crosscutting Concepts			**Aligned *PhD Science* Lessons**
1	Patterns • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.		Level 3 M1 L11–L15 Level 3 M1 L19–L20 Level 3 M1 L27–L29 Level 3 M2 L3–L8 Level 3 M2 L13–L15 Level 3 M3 L1–L8 Level 3 M3 L14–L18 Level 3 M3 L26–L28 Level 3 M4 L1–L9 Level 3 M4 L28–L30
2	Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.		Level 3 M1 L1–L3 Level 3 M1 L16–L18 Level 3 M1 L21–L29 Level 3 M2 L9–L12 Level 3 M2 L16–L28 Level 3 M3 L9–L13 Level 3 M3 L19–L25 Level 3 M4 L1–L3 Level 3 M4 L10–L30
3	Scale, Proportion, and Quantity • Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.		Level 3 M1 L4–L10 Level 3 M2 L1–L2 Level 3 M3 L1–L3 Level 3 M3 L14–L15
4	Systems and System Models • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.		Level 3 M1 L1–L3 Level 3 M1 L16–L20 Level 3 M2 L6–L15 Level 3 M2 L20–L28 Level 3 M3 L9–L11 Level 3 M4 L1–L30

Connections to Engineering, Technology, and Applications of Science		Aligned *PhD Science* Lessons
Interdependence of Science, Engineering, and Technology • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. • Knowledge of relevant scientific concepts and research findings is important in engineering. • Science and technology support each other.		Level 3 M4 L23–L27
Influence of Engineering, Technology, and Science on Society and the Natural World • Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. • People's needs and wants change over time, as do their demands for new and improved technologies. • When new technologies become available, they can bring about changes in the way people live and interact with one another.		Level 3 M1 L21–L26 Level 3 M4 L22–L27

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Key: Module (M), Lesson (L)

PhD Science Level 4

The Grade 4 South Dakota Science Standards are fully covered by the Level 4 *PhD Science* curriculum. A detailed analysis of alignment appears in the table below.

Grade 4 Standards			**Aligned *PhD Science* Lessons**
Physical Science			
Energy			
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–L7 Level 4 M2 L24–L26
4-PS3-2	Make observations to provide evidence for how energy can be transferred from place to place by sound, light, heat, and electric currents.		Level 4 M2 L1–L5 Level 4 M2 L10–L11 Level 4 M2 L24–L26
4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.		Level 4 M2 L8–L9 Level 4 M2 L24–L26
4-PS3-4	Design, test, and refine a device that converts energy from one form to another.		Level 4 M2 L12–L26
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 to provide evidence that waves can cause objects to move.		Level 4 M3 L7–L14 Level 4 M3 L29–L31
4-PS4-2	Develop a model to describe how light reflecting from objects and entering the eye allows objects to be seen.		Level 4 M4 L1–L13 Level 4 M4 L20–L26
4-PS4-3	Create and compare multiple solutions that use patterns to transfer information.		Level 4 M4 L14–L19 Level 4 M4 L24–L26
Life Science			
From Molecules to Organisms: Structures and Processes			
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–L6 Level 4 M3 L20 Level 4 M3 L26–L31
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–L6 Level 4 M3 L15–L25 Level 4 M3 L29–L31

Earth and Space Science			
Earth's Place in the Universe			
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–L5 Level 4 M1 L19–L20 Level 4 M1 L25–L27
Earth's Systems			
4-ESS2-1	Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.		Level 4 M1 L6–L11 Level 4 M1 L25–L27
4-ESS2-2	Analyze and interpret data from maps to describe patterns of Earth's features.		Level 4 M1 L18–L20 Level 4 M1 L25–L27
Earth and Human Activity			
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–L27
4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.		Level 4 M1 L12–L17 Level 4 M1 L25–L27
Engineering Design			
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–L23
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–L17
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 M2 L23–L27 Level 3 M4 L23–L27 Level 5 M1 L18–L22

Science and Engineering Practices			**Aligned *PhD Science* Lessons**
1	Asking Questions and Defining Problems • Ask questions about what would happen if a variable is changed. • Identify scientific (testable) and nonscientific (non-testable) questions. • Ask questions that can be investigated and predict reasonable outcomes based on patterns, such as cause and effect relationships. • Use prior knowledge to describe problems that can be solved. • Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.		Level 4 M1 L1–L2 Level 4 M2 L1–L3 Level 4 M2 L8–L9 Level 4 M3 L1–L3 Level 4 M3 L15–L19 Level 4 M4 L1–L2
2	Developing and Using Models • Identify limitations of models. • Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. • Develop and/or use models to describe and/or predict phenomena.		Level 4 M1 L1–L2 Level 4 M2 L1–L3 Level 4 M2 L8–L11 Level 4 M2 L15–L16 Level 4 M3 L1–L3 Level 4 M3 L7–L11 Level 4 M4 L1–L8 Level 4 M4 L10–L23

	• Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. • Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.		
3	Planning and Carrying Out Investigations • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.		Level 4 M1 L6–L11 Level 4 M1 L21–L22 Level 4 M2 L6–L7 Level 4 M2 L10–L14 Level 4 M3 L15–L19 Level 4 M4 L7–L9 Level 4 M4 L14–L16 Level 4 M4 L20–L23
4	Analyzing and Interpreting Data • Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.		Level 4 M1 L12–L20 Level 4 M1 L23–L24 Level 4 M4 L10–L13
6	Constructing Explanations and Designing Solutions • Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard). • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Apply scientific ideas to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.		Level 4 M1 L3–L7 Level 4 M1 L12–L18 Level 4 M1 L21–L22 Level 4 M1 L25–L27 Level 4 M2 L4–L5 Level 4 M2 L15–L26 Level 4 M3 L24–L25 Level 4 M3 L29–L31 Level 4 M4 L14–L26
7	Engaging in Argument from Evidence • Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • 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 4 M3 L4–L5 Level 4 M3 L21–L23 Level 4 M3 L26–L28 Level 4 M4 L7–L8
8	Obtaining, Evaluating, and Communicating Information		Level 4 M1 L3–L5 Level 4 M1 L23–L24

	• Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.		Level 4 M3 L4–L6 Level 4 M3 L10–L11 Level 4 M3 L20–L23 Level 4 M3 L26–L28 Level 4 M4 L17–L19

Disciplinary Core Ideas			**Aligned *PhD Science* Lessons**
PS3.A	**Definitions of Energy**		
	Defining the relationship between energy and motion, sound, light, heat, electricity, and collisions.		Level 4 M2 L1–L3 Level 4 M2 L10–L11 Level 4 M2 L15–L16 Level 4 M2 L24–L26
PS3.B	**Conservation of Energy and Energy Transfer**		
	Describing energy transfer in various forms (motion, sound, light, heat, electricity, and collisions).		Level 4 M2 L1–L3 Level 4 M2 L10–L26
PS3.C	**Relationship between Energy and Forces**		
	Understanding the impact of energy transfer on various forces, and forces on energy transfer.		Level 4 M2 L8–L9 Level 4 M2 L24–L26
PS3.D	**Energy in Chemical Processes and Everyday Life**		
	Designing a device capable of converting energy from one form to another. Use models to describe energy conversion from sunlight to various functions in living species.		Level 4 M2 L12–L14 Level 4 M2 L24–L26
PS4.A	**Wave Properties**		
	Developing a model to describe wave and light patterns.		Level 4 M3 L7–L11
PS4.B	**Electromagnetic Radiation**		
	Developing a model to describe radiation (wave) and light patterns.		Level 4 M4 L1–L13 Level 4 M4 L20–L26
PS4.C	**Information Technologies and Instrumentation**		
	Developing and optimizing multiple pattern solutions to information transfer.		Level 4 M4 L14–L19 Level 4 M4 L24–L26
LS1.A	**Structure and Function**		
	Making an argument about how the structure and function of plant and animal anatomy can support growth, behavior, and reproduction.		Level 4 M3 L1–L6 Level 4 M3 L20 Level 4 M3 L26–L31
LS1.D	**Information Processing**		
	Modeling and describing the processing of the five senses to the brain to support survival, growth, behavior, and reproduction.		Level 4 M3 L1–L6 Level 4 M3 L15–L25 Level 4 M3 L29–L31

			Level 4 M4 L10–L13
ESS1.C	**The History of Planet Earth**		
	Utilizing patterns in rock formations and fossils to describe changes in the Earth over time.		Level 4 M1 L1–L5 Level 4 M1 L19–L20 Level 4 M1 L25–L27
ESS2.A	**Earth Materials and Systems**		
	Making observations and collecting data as evidence of weathering or erosion. Describing the interaction of the geosphere, biosphere, hydrosphere, and/or atmosphere.		Level 4 M1 L6–L11 Level 4 M1 L25–L27
ESS2.B	**Plate Tectonics and Large-Scale System Interactions**		
	Analyzing and interpreting data from Earth maps to describe physical patterns and features on the Earth's surface.		Level 4 M1 L18–L20 Level 4 M1 L25–L27
ESS2.E	**Biogeology**		
	Using fossils as evidence to support changes in the Earth's landscape over time.		Level 4 M1 L6–L11 Level 4 M1 L25–L27
ESS3.A	**Natural Resources**		
	Using data and observations to describe how energy and fuel are derived from Earth's natural resources.		Level 4 M1 L21–L27
ESS3.B	**Natural Hazards**		
	Providing a design solution that protects against severe weather-related hazards.		Level 4 M1 L12–L17 Level 4 M1 L25–L27
ETS1.A	**Defining and Delimiting an Engineering Problem**		
	Understanding that solutions to a problem are limited by the availability of materials and resources. These limitations can be minimized through the optimization of design.		Level 4 M2 L17–L26
ETS1.B	**Developing Possible Solutions**		
	Researching a problem through available resources, such as the internet, library, or observation, and brainstorming prior to generating a design strategy.		Level 4 M1 L12–L17 Level 4 M4 L20–L23
ETS1.C	**Optimizing the Design Solution**		
	Comparing designs, looking for the best possible solution within a given set of constraints.		Level 4 M1 L12–L17 Level 4 M4 L20–L23

Crosscutting Concepts			**Aligned *PhD Science* Lessons**
1	Patterns • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.		Level 4 M1 L1–L5 Level 4 M1 L18–L22 Level 4 M2 L4–L5 Level 4 M2 L8–L11 Level 4 M2 L24–L26 Level 4 M3 L1–L3 Level 4 M3 L7–L11 Level 4 M3 L20 Level 4 M3 L24–L28 Level 4 M4 L1–L4 Level 4 M4 L7–L8

			Level 4 M4 L17–L23
2	Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.		Level 4 M1 L6–L17 Level 4 M1 L19–L20 Level 4 M1 L23–L27 Level 4 M2 L1–L7 Level 4 M2 L10–L14 Level 4 M2 L24–L26 Level 4 M3 L6–L11 Level 4 M3 L15–L23 Level 4 M4 L3–L16 Level 4 M4 L24–L26
4	Systems and System Models • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.		Level 4 M1 L1–L2 Level 4 M1 L12–L17 Level 4 M1 L21–L24 Level 4 M2 L1–L11 Level 4 M2 L15–L26 Level 4 M3 L4–L5 Level 4 M3 L7–L9 Level 4 M3 L15–L19 Level 4 M3 L21–L23 Level 4 M3 L26–L31 Level 4 M4 L1–L8 Level 4 M4 L10–L23
5	Energy and Matter • Matter is made of particles. • Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. • Energy can be transferred in various ways and between objects.		Level 4 M2 L1–L3 Level 4 M2 L8–L26 Level 4 M3 L1–L3 Level 4 M3 L10–L19

Connections to Engineering, Technology, and Applications of Science		**Aligned *PhD Science* Lessons**
Interdependence of Science, Engineering, and Technology • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. • Knowledge of relevant scientific concepts and research findings is important in engineering. • Science and technology support each other.		Level 4 M1 L12–L17
Influence of Engineering, Technology, and Science on Society and the Natural World • Engineers improve existing technologies or develop new ones. • Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. • People's needs and wants change over time, as do their demands for new and improved technologies.		Level 4 M1 L12–L17 Level 4 M1 L23–L24 Level 4 M2 L15–L23

South Dakota Science Standards Correlation to *PhD Science*™

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

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

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

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

Key: Module (M), Lesson (L)

PhD Science Level 5

The Grade 5 South Dakota Science Standards are fully covered by the Level 5 *PhD Science* curriculum. A detailed analysis of alignment appears in the table below.

Grade 5 Standards			**Aligned *PhD Science* Lessons**
Physical Science			
Matter and Its Interactions			
5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.		Level 5 M1 L5–L10 Level 5 M1 L23–L26
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–L17 Level 5 M1 L23–L26
5-PS1-3	Make observations and measurements to identify materials based on their properties.		Level 5 M1 L1–L4 Level 5 M1 L11–L17 Level 5 M1 L23–L26
5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.		Level 5 M1 L1–L2 Level 5 M1 L13–L26
Motion and Stability: Forces and Interactions			
5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.		Level 5 M4 L3–L4 Level 5 M4 L24–L26
Energy			
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–L19 Level 5 M2 L24–L26
Life Science			
From Molecules to Organisms: Structures and Processes			
5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.		Level 5 M2 L3–L5 Level 5 M2 L20–L26
Ecosystems: Interactions, Energy, and Dynamics			
5-LS2-1	Develop a model to describe the movement of matter and energy among producers, consumers, decomposers, and the environment.		Level 5 M2 L1–L2 Level 5 M2 L6–L14 Level 5 M2 L24–L26

Earth and Space Science			
Earth's Place in the Universe			
5-ESS1-1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to distances from the Earth.		Level 5 M4 L18–L19 Level 5 M4 L24–L26
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–L2 Level 5 M4 L5–L17 Level 5 M4 L20–L26
Earth's Systems			
5-ESS2-1	Develop a model to describe the interaction of geosphere, biosphere, hydrosphere, and/or atmosphere.		Level 5 M3 L1–L3 Level 5 M3 L6–L13 Level 5 M3 L19–L27
5-ESS2-2	Describe and graph the amounts and percentages of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.		Level 5 M3 L4–L5 Level 5 M3 L19–L27
Earth and Human Activity			
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–L18 Level 5 M3 L24–L27
Engineering Design			
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–L26 Level 3 M4 L23–L27 Level 4 M2 L17–L23
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–L23
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–L22

Science and Engineering Practices			Aligned *PhD Science* Lessons
2	Developing and Using Models • Identify limitations of models. • Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. • Develop and/or use models to describe and/or predict phenomena. • Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. • Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.		Level 5 M1 L1–L2 Level 5 M1 L5–L10 Level 5 M1 L13–L14 Level 5 M1 L23–L26 Level 5 M2 L1–L2 Level 5 M2 L6–L7 Level 5 M2 L14 Level 5 M2 L20 Level 5 M3 L1–L3 Level 5 M3 L6–L16 Level 5 M3 L19–L27 Level 5 M4 L1–L4 Level 5 M4 L7–L18 Level 5 M4 L20–L26
3	Planning and Carrying Out Investigations		Level 5 M1 L13–L14 Level 5 M1 L18–L22 Level 5 M2 L3–L5

	• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered. • Evaluate appropriate methods and/or tools for collecting data. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution. • Make predictions about what would happen if a variable changes. • Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.		Level 5 M3 L10–L11 Level 5 M4 L5–L6 Level 5 M4 L18–L19
4	Analyzing and Interpreting Data • Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. • Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Use data to evaluate and refine design solutions.		Level 5 M1 L15–L17 Level 5 M2 L3–L5 Level 5 M2 L8–L13 Level 5 M2 L15–L17 Level 5 M3 L4–L5 Level 5 M3 L14–L16 Level 5 M4 L14–L15
5	Using Mathematics and Computational Thinking • Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success. • Organize simple data sets to reveal patterns that suggest relationships. • Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems. • Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.		Level 5 M1 L3–L4 Level 5 M1 L15–L22 Level 5 M3 L10–L11 Level 5 M3 L24–L27 Level 5 M4 L5–L6
7	Engaging in Argument from Evidence • Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • 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 5 M1 L3–L4 Level 5 M2 L3–L5 Level 5 M2 L8–L11 Level 5 M2 L21–L23 Level 5 M3 L19–L23 Level 5 M4 L5–L6 Level 5 M4 L13–L17 Level 5 M4 L20–L21
8	Obtaining, Evaluating, and Communicating Information • Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.		Level 5 M2 L6–L7 Level 5 M2 L10–L11 Level 5 M2 L18–L20 Level 5 M3 L9

	• Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.		Level 5 M3 L14–L16 Level 5 M3 L19–L27 Level 5 M4 L18–L19

Disciplinary Core Ideas			**Aligned *PhD Science* Lessons**
PS1.A	**Structure of Matter**		
	Developing models that portray matter as particles too small to be seen, yet can be identified macroscopically based on their properties. Collecting evidence that matter is always conserved.		Level 5 M1 L5–L17 Level 5 M1 L23–L26
PS1.B	**Chemical Reactions**		
	Providing quantitative evidence of the conservation of matter during both physical and chemical changes. Conducting investigations to prove whether changes observed during the mixing of substances are physical or chemical.		Level 5 M1 L1–L2 Level 5 M1 L9–L26
PS2.B	**Types of Interactions**		
	Using scientific ideas to ask questions and conduct investigations about cause and effect relationships pertaining to gravitational, electric, and magnetic interactions.		Level 5 M4 L3–L4 Level 5 M4 L24–L26
PS3.D	**Energy in Chemical Processes and Everyday Life**		
	Designing a device capable of converting energy from one form to another. Use models to describe energy conversion from sunlight to various functions in living species.		Level 5 M2 L6–L7 Level 5 M2 L15–L19 Level 5 M2 L24–L26
LS1.C	**Organization for Matter and Energy Flow in Organisms**		
	Using evidence to describe how plants get the materials they need to survive from air and water. Developing a model to show how matter and energy can be transferred through different participants within an ecosystem.		Level 5 M2 L3–L5 Level 5 M2 L8–L9 Level 5 M2 L15–L19 Level 5 M2 L24–L26
LS2.A	**Interdependent Relationships in Ecosystems**		
	Making arguments about how some animals form groups to help members survive.		Level 5 M2 L1–L2 Level 5 M2 L8–L14 Level 5 M2 L20 Level 5 M2 L24–L26
LS2.B	**Cycles of Matter and Energy Transfer in Ecosystems**		
	Developing a model to show how matter and energy can be transferred through different participants within an ecosystem.		Level 5 M2 L6–L7 Level 5 M2 L10–L14 Level 5 M2 L24–L26
ESS1.A	**The Universe and Its Stars**		
	Supporting the argument that distance from the Earth plays a role in the brightness of the sun and other stars.		Level 5 M4 L18–L19 Level 5 M4 L24–L26

ESS1.B	**Earth and the Solar System**		
	Using graphical data to reveal changing patterns in the length of shadows, day and night, and the appearance of the night sky over time.		Level 5 M4 L1–L2 Level 5 M4 L5–L18 Level 5 M4 L20–L26
ESS2.A	**Earth Materials and Systems**		
	Making observations and collecting data as evidence of weathering or erosion. Describing the interaction of the geosphere, biosphere, hydrosphere, and/or atmosphere.		Level 5 M3 L1–L13 Level 5 M3 L24–L27
ESS2.C	**The Roles of Water in Earth's Surface Processes**		
	Using data to describe water distribution on the Earth's surface, as well as its role in erosion and weathering.		Level 5 M3 L4–L5 Level 5 M3 L24–L27
ESS3.C	**Human Impacts on Earth Systems**		
	Generating and comparing multiple solutions to minimize the impact of the Earth's natural processes on humans. Combining information about how communities use science to protect the Earth's resources and environment.		Level 5 M3 L14–L27

Crosscutting Concepts			**Aligned *PhD Science* Lessons**
1	Patterns • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.		Level 5 M1 L7–L8 Level 5 M2 L1–L5 Level 5 M2 L8–L9 Level 5 M2 L15–L17 Level 5 M3 L6–L9 Level 5 M4 L1–L17 Level 5 M4 L20–L26
2	Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.		Level 5 M1 L1–L2 Level 5 M1 L5–L6 Level 5 M1 L9–L10 Level 5 M1 L18–L22 Level 5 M2 L3–L7 Level 5 M2 L12–L13 Level 5 M2 L18–L23 Level 5 M3 L6–L8 Level 5 M3 L12–L18 Level 5 M4 L5–L6 Level 5 M4 L24–L26
3	Scale, Proportion, and Quantity • Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.		Level 5 M1 L3–L4 Level 5 M1 L13–L17 Level 5 M1 L23–L26 Level 5 M2 L10–L11 Level 5 M3 L1–L5 Level 5 M3 L10–L11 Level 5 M3 L24–L27 Level 5 M4 L18–L19 Level 5 M4 L24–L26
4	Systems and System Models		Level 5 M1 L3–L4

	• A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.		Level 5 M1 L15–L17 Level 5 M2 L1–L2 Level 5 M2 L6–L11 Level 5 M2 L14 Level 5 M2 L18–L19 Level 5 M2 L24–L26 Level 5 M3 L1–L9 Level 5 M3 L12–L13 Level 5 M3 L19–L27 Level 5 M4 L1–L2 Level 5 M4 L7–L23
5	Energy and Matter • Matter is made of particles. • Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. • Energy can be transferred in various ways and between objects.		Level 5 M1 L5–L8 Level 5 M1 L13–L14 Level 5 M1 L23–L26 Level 5 M2 L6–L11 Level 5 M2 L14–L19 Level 5 M2 L24–L26 Level 5 M3 L10–L11 Level 5 M4 L3–L4

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Interdependence of Science, Engineering, and Technology • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. • Knowledge of relevant scientific concepts and research findings is important in engineering. • Science and technology support each other.		Level 5 M4 L7–L8