Teacher's Edition

Grade 4 • Unit 3

Inspire Science

Our Dynamic Earth

McGraw Hill Education

Performance Expectations at a Glance

In this unit, students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to perform the following Performance Expectations.

Performance Expectations	MODULE: Earth and Its Changing Features	MODULE: Earthquakes
3-5 ETS1-1		●
3-5 ETS1-2	●	●
3-5 ETS1-3	●	●
4-ESS1-1	●	
4-ESS2-1	●	
4-ESS2-2	●	●
4-ESS3-2	●	●
4-PS4-1		●

Correlations by Module to the NGSS

MODULE: Earth and Its Changing Features		
3-5-ETS1-2	**Engineering Design**	
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.**	*61–64*
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.		*30–31, 37–38, 47, 61–66*
DCI Disciplinary Core Ideas		
ETS1.B: Developing Possible Solutions • 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. • 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.		*61–64*

Inquiry activities are in Italics.

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CCC Crosscutting Concepts	
Influence of Science, Engineering, and Technology 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.	*63*

3-5-ETS1-3	Engineering Design	
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.**	*61–63*
SEP Science and Engineering Practices		
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.		*8–11, 21–23, 30–31, 54–55, 62–63*
DCI Disciplinary Core Ideas		
ETS1.B: Developing Possible Solutions • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.		*61–64*
ETS1.C: Optimizing the Design Solution • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.		*62–63*

Inquiry activities are in Italics.

4-ESS1-1	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.** *[Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]*	*30–31, 32–33, 34, 35*
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Identify the evidence that supports particular points in an explanation. (4-ESS1-1))		*30–31, 37–38, 47, 61–66*
DCI Disciplinary Core Ideas		
ESS1.C: The History of Planet Earth • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)		*30–31, 32–33*
CCC Crosscutting Concepts		
Patterns • Patterns can be used as evidence to support an explanation. (4-ESS1-1)		6–7, 11, *21–23,* 24, *30–31, 38*
Connections to Nature of Science **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes consistent patterns in natural systems. (4-ESS1-1)		*37–38*

Inquiry activities are in Italics.

4-ESS2-1	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.** *[Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]*	*46–47, 54–55, 61–66*
SEP Science and Engineering Practices		
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.		*8–11, 21–23, 30–31, 46–47, 54–55, 64–65*
DCI Disciplinary Core Ideas		
ESS2.A: Earth Materials and Systems • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.		48–49, 50–53
ESS2.E: Biogeology • Living things affect the physical characteristics of their regions.		48–49
CCC Crosscutting Concepts		
Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change.		*37–38, 46–47, 54–55, 64–66*

Inquiry activities are in Italics.

4-ESS2-2	Earth's Systems	
4-ESS2-2	**Analyze and interpret data from maps to describe patterns of Earth's features.** *[Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]*	6–7, 11, 18–19, 24
SEP Science and Engineering Practices		
Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning.		6–7, *8–11*, *21–23*, 24, *30–31*, *46–47*, *54–55*, *64–67*
DCI Disciplinary Core Ideas		
ESS2.B: Plate Tectonics and Large-Scale System Interactions • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.		*16–17, 18–19,* 24
CCC Crosscutting Concepts		
Patterns • Patterns can be used as evidence to support an explanation.		6–7, 11, *21–23*, 24, *30–31, 37–38*

4-ESS3-2	Earth and Human Activity	
4-ESS3-2	**Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*** *[Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]*	*61–66*
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.		*30–31, 37–38, 47, 61–66*

Inquiry activities are in Italics.

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DCI Disciplinary Core Ideas	
ESS3.B: Natural Hazards • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.	18–19, 50, 56–57
ETS1.B: Designing Solutions to Engineering Problems • Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary)	*63, 65, 66*
CCC Crosscutting Concepts	
Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change.	*37-38, 46–47, 54–55, 64–66*
Connections to Engineering, Technology, and Applications of Science **Influence of Engineering, Technology, and Science on Society and the Natural World** • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.	*63*
ELD Connections	
ELD.PI.4.6	34–35 Teacher's Edition *only*: 13, 36, 48, 51, 56
ELD. PI.4.10.b	26, 57 Teacher's Edition *only*: 11, 33, 40
CCSS ELA/Literacy Connections	
W.4.3.a, b, c, d, e; W.4.10	33
W.4.4	33, 57
W.7, W.8	26, 42, 57
L.4.1, a, b, c, d, e, g, h	26, 33, 57, 60, *66*
L.4.1.f; L.4.2, a, b, c, d; L.4.5, a, b, c	33, 57
L.4.6	24, 40, 57, 60, 67
ALSO INTEGRATES:	
SEP Developing and Using Models	*22–23*
SEP Obtaining, Evaluating, and Communicating Information	*30–31, 46–47, 54–55,*
RF.4	35, 50
RI.7	14–15

Inquiry activities are in Italics.

MODULE: Earthquakes

3-5 ETS1-1	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.**	126 Teacher's Edition *only*: 123
SEP Science and Engineering Practices		
Asking Questions and Defining Problems Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. • 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.		*118–119*
DCI Disciplinary Core Ideas		
ETS1.A: Defining and Delimiting Engineering Problems • 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.		126, 127
CCC Crosscutting Concepts		
Influence of Science, Engineering, and Technology on Society and the Natural World • People's needs and wants change over time, as do their demands for new and improved technologies.		111, 113, 114–115 Teacher's Edition *only*: 117

3-5-ETS1-2	Engineering Design	
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.**	*118–199,* 127, 128
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.		*108–109, 53,* 126–128

Inquiry activities are in Italics.

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DCI Disciplinary Core Ideas	
ETS1.B: Developing Possible Solutions • 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. • 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.	125, 126–128
CCC Crosscutting Concepts	
Influence of Science, Engineering, and Technology 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.	111, 113, 114–115 Teacher's Edition *only*: 117

3-5-ETS1-3	Engineering Design	
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.**	126
SEP Science and Engineering Practices		
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.		126–127
DCI Disciplinary Core Ideas		
ETS1.B: Developing Possible Solutions • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.		125, 126–128
ETS1.C: Optimizing the Design Solution • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.		125, 127–128

Inquiry activities are in Italics.

4-ESS2-2	Earth's Systems	
4-ESS2-2	**Analyze and interpret data from maps to describe patterns of Earth's features.** *[Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]*	73, *74–76*, 78, 79, 80–81, *83*, 84
SEP Science and Engineering Practices		
Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning.		*74*, *83*, *127*
DCI Disciplinary Core Ideas		
ESS2.B: Plate Tectonics and Large-Scale System Interactions • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.		71, 73, *74–76*, 78, 80–81, *83*, 84 Teacher's Edition *only*: 77, 84
CCC Crosscutting Concepts		
Patterns • Patterns can be used as evidence to support an explanation.		*74–77*, 80–81, *83*, 85, *99*, 103

4-ESS3-2	Reduce Earthquake Damage	
4-ESS3-2	**Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.** *[Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]*	118–119, 123–128
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.		108–109, 119, *126–127* Teacher's Edition *only*: 84

Inquiry activities are in Italics.

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DCI Disciplinary Core Ideas	
ESS3.B: Natural Hazards • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.	78, 110, 111, 112, 113, 114–115, 116–117, *118–119*
ETS1.B: Designing Solutions to Engineering Problems • Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary)	*125–128*
CCC Crosscutting Concepts	
Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change.	*98–99*, 103, 104
***Connections to Engineering, Technology, and Applications of Science* Influence of Engineering, Technology, and Science on Society and the Natural World** • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.	114–115

4-PS4-1	Earth's Place in the Universe	
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.** *[Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]*	*90–92*, 93, 95–96, *98–99*, 102
SEP Science and Engineering Practices		
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle.		73, *74–76*, 80–81, *83*, 84, *91*, *98–99*, *108–109*, *126–128* Teacher's Edition *only*: 93
***Connections to Nature of Science* Scientific Knowledge is Based on Empirical Evidence** • Science findings are based on recognizing patterns.		*83*, *99*

Inquiry activities are in Italics.

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DCI Disciplinary Core Ideas	
PS4.A: Wave Properties • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).	88–89, *90–93*, 94, 95–96 Teacher's Edition *only*: 93, 102
CCC Crosscutting Concepts	
Patterns • Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena.	*74–76*, 80–81, *83*, 85, *91*, *98–99*, 103 Teacher's Edition *only*: 77, 84
CCSS Math Connections	
4.NF.7	103
4.G.A.1	74–76
ELD Connections	
PI.C.11	Teacher's Edition *only*: 77
ELD.PI.4.6	80–81, 114–115 Teacher's Edition *only*: 84, 102, 116, 120
ELD.PI.4.11	86 Teacher's Edition *only*: 84, 93, 100
ELD.PI.4.3	Teacher's Edition *only*: 82
CCSS ELA/Literacy Connections	
SL.4.2	118–119, 125
W.4.8	81, 115, 118–119
ALSO INTEGRATES:	
SEP Asking Questions and Defining Problems	*109* Teacher's Edition *only*: 100, 116
SEP Obtaining, Evaluating, and Communicating Information	*74–77*, *83*, *90–93*, *98–99*, *118–119*, *125–128*
SEP Planning and Carrying Out Investigations	*90–92*, *98–99*, *108–109*, *118–119*, *123–128*
CCC Structure and Function	*109*

Inquiry activities are in Italics.

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EP&C Principle III Concept a	86
EP&C Principle IV Concept b	*83*
EP&C Principle V Concept a	86
ELA RF.4.4	95, 111

Inquiry activities are in Italics.