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: **Human Impact on the Environment**	Module: **Earth and Human Activity**
MS-ESS3-3	●	
MS-ESS3-4		●
MS-ESS3-5	●	
MS-ETS1-1	●	
MS-ETS1-2	●	
MS-ETS1-3	●	
MS-ETS1-4	●	

Correlations by Module to the NGSS

MODULE: Human Impact on the Environment

MS-ESS3	Earth and Human Activity	
MS-ESS3-3.	**Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*** [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]	*26–28,* 105–110

SEP Science and Engineering Practices	
Constructing Explanations and Designing Solutions* Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-ESS3-3) * Other aspects of this SEP are integrated throughout this module and are listed in the *Also Integrates* section.	*26–28, 42, 53–55,* 105–110, 111

Labs and investigations are in italics.

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DCI Disciplinary Core Ideas	
ESS3.C: Human Impacts on Earth Systems • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)	10, 13, *13–14,* 14, 16, 18–22, 30–32, 38, 39A–39B, *40–41,* 41–43, *45–46,* 47–49, *49–50,* 50, 51–52, *53–54*, 55, 56–58, 64–68, 70, 76, 96, *97,* 98, 104, 105–110, 111, Investigation *pH Tolerance of Aquatic Life* (online)
CCC Crosscutting Concepts	
Cause and Effect* • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) * Other aspects of this CCC are integrated throughout this module and are listed in the *Also Integrates* section.	22, 43, 57, 70, *71–72, 76, 88–90,* 105–110, 111
Connections to Engineering, Technology, and Applications of Science **Influence of Science, Engineering, and Technology on Society and the Natural World** • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-3)	7, 26, 35, 39A–39B, 42, *53–54,* 71, 73–74, *75, 100*
CCSS ELA/Literacy Connections	
ELA WHST.6–8.7	19, 48, 52, *53–54, 75, 100,* 105–110, 111, Literacy Skill Handbook (online)
ELA WHST.6–8.8	48, 52, *53–54, 75, 100,* 105–110, Literacy Skill Handbook (online)
CCSS Math Connections	
Math 6.RP.A.1	*13–14,* 105–110, Math Skill Handbook (online)
Math 6.EE.B.6	*38–39,* 44, *88–90, 94,* 103, 105–110, Math Skill Handbook (online)

MS-ESS3	Earth and Human Activity	
PERFORMANCE EXPECTATION **MS-ESS3-5.**	**Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.** [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]	81, *85, 86, 88–90,* 99, *100,* 102

Labs and investigations are in italics.

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SEP Science and Engineering Practices	
Asking Questions and Defining Problems* Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, clarifying arguments and models. • Ask questions to identify and clarify evidence of an argument. (MS-ESS3–5) * Other aspects of this SEP are integrated throughout this module and are listed in the *Also Integrates* section.	81, *85, 86, 88–90,* 99, *100,* 102
DCI Disciplinary Core Ideas	
ESS3.D: Global Climate Change • Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3–5)	84, *85,* 86, *86–87, 88–90,* 91, 99, *100,* 101, *101,* 104, 105–110, 111
CCC Crosscutting Concepts	
Stability and Change • Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)	39A–39B, 42, 58, 84, *86–87, 88–90,* 91, *92,* 93, *94,* 95, 96–98, 99
CCSS ELA/Literacy Connections	
ELA RST.6–8.1	8–9, 20, 36–37, *40–41,* 42, 62–63, 82–83, 98, Literacy Skill Handbook (online)
CCSS Math Connections	
Math MP.2	*38–39,* 44, *88–90, 94,* 103, 105–110, Math Skill Handbook (online)
Math 6.EE.B.6	*38–39,* 44, *88–90, 94,* 103, 105–110, Math Skill Handbook (online)

MS-ETS1	Engineering Design	
MS-ETS1-1.	**Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**	*53–54*, 105–110

Labs and investigations are in italics.

Continued from previous page.

SEP Science and Engineering Practices	
Asking Questions and Defining Problems* Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, clarifying arguments and models. • Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) * Other aspects of this SEP are integrated throughout this module and are listed in the *Also Integrates* section.	105–110, Science and Engineering Practices Handbook (online)
DCI Disciplinary Core Ideas	
ETS1.A: Defining and Delimiting Engineering Problems • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)	*53–54*, 105–110
CCC Crosscutting Concepts	
Connections to Science, Technology, Society and the Environment **Influence of Science, Engineering, and Technology on Society and the Natural World** • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)	39A–39B, *53–54*, 105–110, Science and Engineering Practices Handbook (online)
• The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)	7, 26, 35, 39A–39B, 42, *53–54,* 71, 73–74, *75, 100,* 100–105, Science and Engineering Practices Handbook (online)
CCSS ELA/Literacy Connections	
ELA RST.6–8.1	8-9, 20, 36-37, *40-41*, 42, 62-63, 82-83, 98, Literacy Skill Handbook (online)
ELA WHST.6–8.8	48, 52, *53-54*, *75*, *100*, 105-110, Literacy Skill Handbook (online)
CCSS Math Connections	
Math MP.2	*38–39,* 44, *88–90, 94,* 103, 105–110, Math Skills Handbook (online)

MS-ETS1	Engineering Design	
MS-ETS1-2.	**Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**	*26–28*, *53–54*, 105–110, Science and Engineering Practices Handbook (online)

Labs and investigations are in italics.

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SEP **Science and Engineering Practices**	
Engaging in Argument from Evidence* Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world. • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2) * Other aspects of this SEP are integrated throughout this module and are listed in the *Also Integrates* section.	*26–28*, *53–54*, *75*, 105–110, Science and Engineering Practices Handbook (online)
DCI **Disciplinary Core Ideas**	
ETS1.B: Developing Possible Solutions • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2) possible solutions. (MS-ETS1-1)	*26–28*, *75*, 105–110, Science and Engineering Practices Handbook (online)
CCSS ELA/Literacy Connections	
ELA RST.6–8.1	8–9, 20, 36–37, *40–41*, 42, 62–63, 82–83, 98, Literacy Skill Handbook (online)
ELA RST.6–8.9	105–110, Literacy Skill Handbook (online)
ELA WHST.6–8.7	19, 48, 52, *53–54*, *75*, *100*, 105–110, 111, Literacy Skill Handbook (online)
ELA WHST.6–8.9	8–9, 20, 36–37, *40–41*, 42, 62–63, 82–83, 98, Literacy Skill Handbook (online)
CCSS Math Connections	
Math MP.2	*38–39,* 44, *88–90, 94,* 103, 105–110, Math Skill Handbook (online)

MS-ETS1	Engineering Design	
MS-ETS1-3.	**Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**	*26–28*, 57, 88–89, *92, 94, 97,* 105–110, Science and Engineering Practices Handbook (online)

Labs and investigations are in italics.

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CCSS ELA/Literacy Connections	
ELA RST.6–8.1	118–119, 140–141, 147, 151, Literacy Skill Handbook (online)
ELA WHST.6–8.1	*120, 126–127, 130–132,* 136, 146–147, 155–160, Literacy Skill Handbook (online)
ELA WHST.6–8.9	*120,* 147, Literacy Skill Handbook (online)
CCSS Math Connections	
Math 6.RP.A.1	*128–129, 130–131,* Math Skill Handbook (online)
Math 7.RP.A.2	*128–129, 130–131,* 155–160, Math Skill Handbook (online)
Math 6.EE.B.6	*142,* Math Skill Handbook (online)
Math 7.EE.B.4	*142,* Math Skill Handbook (online)

ALSO INTEGRATES:	
SEP Asking Questions and Defining Problems	161
SEP Developing and Using Models	150
SEP Planning and Carrying Out Investigations	155–160, 161
SEP Analyzing and Interpreting Data	*120, 122–123, 123–124,* 125, *128–129, 130–132, 142*
SEP Using Mathematics and Computational Thinking	*128–129, 130–131, 142,* 153
SEP Constructing Explanations and Designing Solutions	118–119, 132, 140–141, 154, 155–160, 161
SEP Obtaining, Evaluating, and Communicating Information	151, 155–160
DCI ETS1.B: Developing Possible Solutions	121A–121B, *148,* 151A–151B, 155–160
DCI LS2.A: Interdependent Relationships in Ecosystems	124
DCI LS2.C: Ecosystem Dynamics, Functioning, and Resilience	*144–145*
CCC Patterns	155–160
CCC Cause and Effect	*126–127, 142,* 151A–151B, 155–160
CCC Systems and System Models	146, 150

Labs and investigations are in italics.

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SEP Science and Engineering Practices	
Analyzing and Interpreting Data* Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3) * Other aspects of this SEP are integrated throughout this module and are listed in the *Also Integrates* section.	*26–28*, 105–110, Lab *The greenhouse effect is a gas!* (online), Science and Engineering Practices Handbook (online)
DCI Disciplinary Core Ideas	
ETS1.B: Developing Possible Solutions • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-3)	*26–28*, *100*, 105–110, Science and Engineering Practices Handbook (online)
• Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)	*26–28*, *100*, 105–110, Science and Engineering Practices Handbook (online)
ETS1.C: Optimizing the Design Solution • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)	*26–28*, Science and Engineering Practices Handbook (online)
CCSS ELA/Literacy Connections	
ELA RST.6–8.1	8–9, 20, 36–37, *40–41*, 42, 62–63, 82–83, 98, Literacy Skill Handbook (online)
ELA RST.6–8.7	21, 22, 29–32, *53–54,* 67, Literacy Skill Handbook (online)
ELA RST.6–8.9	105–110 Literacy Skill Handbook (online)
CCSS Math Connections	
Math MP.2	*38–39,* 44, *88–90, 94,* 103, 105–110, Math Skill Handbook (online)

MS-ETS1	Engineering Design	
PERFORMANCE EXPECTATION **MS-ETS1-4.**	**Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**	*26–28*, Science and Engineering Practices Handbook (online)

Labs and investigations are in italics.

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SEP Science and Engineering Practices	
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)	*26–28*, Lab *The greenhouse effect is a gas!* (online), Science and Engineering Practices Handbook (online)
DCI Disciplinary Core Ideas	
ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)	*26–28*, Lab *The greenhouse effect is a gas! (online),* Science and Engineering Practices Handbook (online)
• Models of all kinds are important for testing solutions. (MS-ETS1-4)	Science and Engineering Practices Handbook (online)
ETS1.C: Optimizing the Design Solution The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)	*26–28*, Science and Engineering Practices Handbook (online)
CCSS ELA/Literacy Connections	
ELA SL.8.5	44, 105–110, Literacy Skill Handbook (online)
CCSS Math Connections	
Math MP.2	*38–39,* 44, *88–90, 94,* 103, 105–110, Math Skill Handbook (online)

Labs and investigations are in italics.

ALSO INTEGRATES:	
SEP Asking Questions and Defining Problems	111
SEP Developing and Using Models	87
SEP Planning and Carrying Out Investigations	*26–28,* 105–110, 111
SEP Analyzing and Interpreting Data	*26–28, 53–54, 71–72, 77, 85, 86–87, 88–90,* 103
SEP Using Mathematics and Computational Thinking	*13–14, 38–39,* 44, *88–90, 94,* 103, 105–110

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SEP Constructing Explanations and Designing Solutions	8–9, *17–18*, *26–28,* 32, 36–37, 39A–39B, *53–54,* 58, 62–63, *69, 71–72,* 82–83, 84, 91
SEP Engaging in Argument from Evidence	42
SEP Obtaining, Evaluating, and Communicating Information	19, 20, *40–41,* 42, *53–54,* 98, *100,* 105–110
Connections to Nature of Science Scientific Investigations Use a Variety of Methods	19, 95
DCI LS2.A: Interdependent Relationships in Ecosystems	96
DCI LS2.C: Ecosystem Dynamics, Functioning, and Resilience	98
DCI PS1.B: Chemical Reactions	97
CCC Patterns	*85, 88–90, 94*
CCC Cause and Effect	21, 30–32, 39A–39B, 42, 44, *50, 69, 86–87, 88–90,* 91, *92,* 93–96, *97,* 98–99
CCC Scale Proportion, and Quantity	84
CCC Systems and System Models	84, 91
CCC Energy and Matter	87
Connections to Nature of Science Science is a Human Endeavor	95
CCSS ELA RST.6–8.3	*11–12, 15–16, 26–28, 38–39, 45–46*
CCSS ELA SL.6.1	3, *17–18,* 20, 42, *53–54,* 81, *75,* 98, *101*

Labs and investigations are in italics.

MODULE: Earth and Human Activity

MS-ESS3	Earth and Human Activity	
MS-ESS3-4.	**Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]	155–160, 161
SEP Science and Engineering Practices		
Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)		*120, 126–127, 130–132,* 136, 146–147, 155–160
DCI Disciplinary Core Ideas		
ESS3.C: Human Impacts on Earth Systems • Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-4)		117, *120,* 121, 121A–121B, 125, *126–127,* 127, *128–129,* 130, *130–132,* 132, 142, *142,* 143, *144–145,* 146–148, *148,* 149, *149–150,* 150, 151A–151B, 152–154
CCC Crosscutting Concepts		
Cause and Effect • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4)		*122–123, 128–129, 130–132,* 133, *144–145,* 146, 150
Connections to Engineering, Technology, and Applications of Science **Influence of Science, Engineering, and Technology on Society and the Natural World** • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1)		121A–121B, *143, 144–145,* 146–147, 151A–151B, 152–154, 155–160, 161
Connections to Nature of Science **Science Addresses Questions About the Natural and Material World** • Science knowledge can describe consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)		*144–145,* 146–147, *148,* 148, 151, 155–160

Labs and investigations are in italics.

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CCC Energy and Matter	147
Connections to Nature of Science Science is a Way of Knowing	*149–150*
CCSS ELA RST.6–8.3	*126–127*
CCSS ELA RST.6–8.7	*128–129*
CCSS ELA RST.6–8.10	133, 147, 151
CCSS ELA SL.8.1	113, 139, 151

Labs and investigations are in italics.