Belvidere Clusterwide Curriculum

Science

6th Grade

Updated Summer, 2024

All Belvidere Cluster curriculum and instruction areas are aligned to the New Jersey Student Learning Standards (NJSLS) in accordance with the NJ Department of Education's curriculum implementation requirements.

Curriculum Coordinator:
Timm Gast
Authors:
Stacy Dalrymple, Harmony Township School

UNITS	Duration	Essential Questions:
Unit 1: Earth's Place in the Universe	12 Weeks	1. What is Earth's place in the Universe? 2. How do the components of our Solar System move and interact with one another? 3. How can the motion of Earth explain seasons and eclipses?
Unit 2: Earth's Systems	12 Weeks	1. How do materials in and on Earth's crust change over time? 2. How does the movement of tectonic plates impact the surface of Earth? 3. How does water influence weather? 4. How have living organisms changed the Earth and how have Earth's changing conditions impacted living organisms?
Unit 3: Earth and Human Activity	12 Weeks	1. How is the availability of natural resources related to naturally occurring processes? 2. How can natural hazards be predicted? 3. How do human activities affect Earth's systems? 4. How do we know our global climate is changing?
Engineering Design	Incorporated throughout the year	Students engage in practices to build, deepen, and apply their knowledge of core ideas and crosscutting concepts.

Student Learning

Career Education (NJDOE CTE Clusters)

Career Readiness, Life Literacies, and Key Skills:

- 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of ***climate change*** (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions.
- 9.4.8.CI.2: Repurpose an existing resource in an innovative way.
- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas
- 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries
- 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective.
- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.
- 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
- 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
- 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
- 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event
- 9.4.8.TL.5: Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration.
- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
- 9.4.8.DC.1: Analyze the resource citations in online materials for proper use.
- 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products
- 9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect
- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.
- 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping
- 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
- 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data.
- 9.4.8.IML.6: Identify subtle and overt messages based on the method of communication.
- 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose.
- 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on ***climate change***.
- 9.4.8.IML.9: Distinguish between ethical and unethical uses of information and media
- 9.4.8.IML.10: Examine the consequences of the uses of media.
- 9.4.8.IML.11: Predict the personal and community impact of online and social media activities.
- 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.
- 9.4.8.IML.13: Identify the impact of the creator on the content, production, and delivery of information.
- 9.4.8.IML.14: Analyze the role of media in delivering cultural, political, and other societal messages.
- 9.4.8.IML.15: Explain ways that individuals may experience the same media message differently

21st Century Themes:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy
- Environmental Literacy

- Creativity and Innovation
- Critical Thinking
- Problem Solving
- Communication
- Collaboration
- Information Literacy
- Media Literacy
- ICT (Information, Communication and Technology) Literacy
- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP3. Attend personal health and financial well-being.
- CRP4. Communicate clearly and effectively and with reason.
- CRP5. Consider the environmental, social and economic impacts of decisions.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9. Model integrity, ethical leadership and effective management.
- CRP10. Plan education and career paths aligned to personal goals.
- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence.
- 1.1.1.A.1 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.
- 1.1.1.A.2 Differentiate among ways that workers can improve earning power through the acquisition of new knowledge and skills.
- 9.1.8.A.5 Relate how the demand for certain skills determines an individual's earning power.
- 9.1.8.D.5 Explain the economic principle of supply and demand.
- 1.1.1.A.1 Identify personal information that should not be disclosed to others and the possible consequences of doing or not doing so
- 1.1.1.A.2 Compare and contrast product facts versus advertising claims.
- 9.1.8.E.4 Prioritize personal wants and needs when making purchases
- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

Reading and Writing Companion Standards:

Language Domain (see substandards for related sub strands)

- L.SS.6.1. Demonstrate command of the system and structure of the English language when writing or speaking.
- L.KL.6.2. Use knowledge of language and its conventions when writing, speaking, reading, or listening.
- L.VL.6.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, including technical meanings, choosing flexibly from a range of strategies.
- L.VI.6.4. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

Reading Domain:

- RL.CR.6.1. Cite textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text.
- RI.CR.6.1. Cite textual evidence and make relevant connections to support analysis of what an informational text says explicitly as well as inferences drawn from the text.
- RL.CI.6.2. Determine the theme of a literary text (e.g., stories, plays or poetry) and explain how it is supported by key details; provide a summary of the text distinct from personal opinions or judgments.
- RI.CI.6.2. Determine the central idea of an informational text and explain how it is supported by key details; provide a summary of the text distinct from personal opinions or judgments.
- RL.IT.6.3. Describe how a particular text's structure unfolds in a series of episodes and use textual evidence to describe how the characters respond or change as the plot moves toward a resolution.
- RI.IT.6.3. Analyze how a particular text's (e.g., article, brochure, technical manual, procedural text) structure unfolds by using textual evidence to describe how a key individual, event, or idea is introduced, illustrated, and elaborated in a text.

- RL.TS.6.4. Analyze how a particular piece (e.g., sentence, chapter, scene, stanza, or section) fits into the overall structure of a text and contributes to the development of the ideas, theme, setting, or plot.
- RI.TS.6.4. Use text structures (e.g., cause-effect, problem-solution), search tools, and genre features (e.g., graphics, captions, indexes) to locate and integrate information.
- RL.PP.6.5. Determine how an author conveys or develops perspective in a text (through the narrator or speaker when appropriate).
- RI.PP.6.5. Identify author's purpose perspective or potential bias in a text and explain the impact on the reader's interpretation.
- RL.MF.6.6. Compare and contrast information or texts to develop a coherent understanding of a theme, topic, or issue when reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text.
- RI.MF.6.6. Integrate information when presented in different media or formats (e.g., visually, quantitatively) to develop a coherent understanding of a topic or issue.
- RI.AA.6.7. Trace the development of and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
- RL.CT.6.8. Compare and contrast literary texts in different forms, by different authors, or from different genres (e.g., stories and poems; historical novels and primary source documents, scientific journals and fantasy stories) in terms of their approaches to similar themes and topics.
- RI.CT.6.8. Compare and contrast informational texts in different forms, by different authors, or from different genres (e.g., a memoir written by and a biography on the same person, historical novels and primary source documents, infographics and scientific journals) in terms of their approaches to similar themes and topics.

Writing Domain: (see substandards for related sub strands)

- W.AW.6.1. Write arguments on discipline-specific content (e.g., social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
- W.IW.6.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- W.NW.6.3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.
- W.WP.6.4. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning; flexibly making editing and revision choices; sustaining effort to fit composition needs and purposes; and attempting to address purpose and audience.
- W.WR.6.5. Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
- W.SE.6.6. Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- W.RW.6.7. Write routinely over extended time frames (time for research, reflection, metacognition/self-correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Speaking and Listening Domain: (see substandards for related sub strands)

- SL.PE.6.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- SL.II.6.2. Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
- SL.ES.6.3. Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.
- SL.PI.6.4. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate speaking behaviors (e.g., eye contact, adequate volume, and clear pronunciation).
- SL.UM.6.5. Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
- SL.AS.6.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Climate Change Strands (6-8th Grade Science)

- MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- MS-ESS2-5: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
- MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- 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.
- MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused climate change over the past century.
- 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.
- MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- 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.
- 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.

Modifications and Accommodations:

Special Education

- Printed copy of board work/notes provided
- Additional time for skill mastery
- Assistive technology
- Behavior management plan
- Center-Based Instruction
- Check work frequently for understanding
- Computer or electronic device utilization
- Extended time on tests/ quizzes
- Have student repeat directions to check for understanding
- Highlighted text visual presentation
- Modified assignment format
- Modified test content
- Modified test format
- Modified test length
- Multiple test sessions
- Multi-sensory presentation
- Preferential seating
- Preview of content, concepts, and vocabulary
- Reduced/shortened written assignments
- Secure attention before giving instruction/directions

- Shortened assignments
- Student working with an assigned partner
- Teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills Open-ended activities
- Think-Pair-Share
- Varied supplemental materials

ELL

- Allowing students to correct errors (looking for understanding)
- Teaching key aspects of a topic Eliminate nonessential information Using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slideshows, videos, etc.) to demonstrate student's learning
- Allowing students to correct errors (looking for understanding)
- Allowing the use of note cards or open-book during testing
- Decreasing the amount of work presented or required
- Having peers take notes or providing a copy of the teacher's notes
- Modifying tests to reflect selected objectives
- Providing study guides
- Reducing the number of answer choices on a multiple choice test
- Tutoring by peers
- Explain/clarify key vocabulary terms

- **At Risk**
- Allowing students to correct errors (looking for understanding)
- Teaching key aspects of a topic Eliminate nonessential information allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slideshows, videos, etc.) to demonstrate student's learning
- Allowing students to select from given choices .
- Allowing the use of note cards or open-book during testing
- Collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test
- decreasing the amount of work presented or required .
- Having peers take notes or providing a copy of the teacher's notes
- Marking students' correct and acceptable work, not the mistakes
- Modifying tests to reflect selected objectives
- Providing study guides
- Reducing the number of answer choices on a multiple choice test
- Tutoring by peers
- Using authentic assessments with real-life problem-solving
- Using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify
- Flexible grouping
- Goal setting with students

- Jigsaw
- Mini workshops to re-teach or extend skills Open-ended activities
- Think-Pair-Share
- Varied supplemental materials

- **Gifted and Talented**
- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Independent research and projects Interest groups for real world application
- Learning contracts
- Leveled rubrics
- Multiple intelligence options
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products_____

- **504**
- Printed copy of board work/notes provided
- Additional time for skill mastery
- Assistive technology
- Behavior management plan
- Center-Based Instruction
- Check work frequently for understanding
- Computer or electronic device utilization
- Extended time on tests/ quizzes
- Have student repeat directions to check for understanding
- Highlighted text visual presentation
- Modified assignment format
- Modified test content
- Modified test format
- Modified test length
- Multiple test sessions
- Multi-sensory presentation
- Preferential seating
- Preview of content, concepts, and vocabulary
- Reduced/shortened written assignments
- Secure attention before giving instruction/directions
- Shortened assignments
- Student working with an assigned partner
- Seacher initiated weekly assignment sheet
- Use open book, study guides, test prototype
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Mini workshops to re-teach or extend skills Open-ended activities

- Think-Pair-Share
- Varied supplemental materials

Unit 1 Overview: Earth's Place in the Universe

Unit 1 Summary:

The performance expectations in ESS1: Earth's Place in the Universe, help students formulate an answer to questions such as: "*What is Earth's place in the Universe, What makes up our solar system and how can the motion of Earth explain seasons and eclipses, and How do people figure out that the Earth and life on Earth have changed through time*?" The ESS1 Disciplinary Core Idea from the NRC Framework is broken down into three sub-ideas: the universe and its stars, Earth and the solar system and the history of planet Earth. Students examine the Earth's place in relation to the solar system, Milky Way galaxy, and universe. There is a strong emphasis on a systems approach, using models of the solar system to explain astronomical and other observations of the cyclic patterns of eclipses and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories that explain the formation and evolution of the universe. Students examine geoscience data in order to understand the processes and events in Earth's history. The crosscutting concepts of patterns, scale, proportion, and quantity, and systems and systems modeling are called out as organizing concepts for these disciplinary core ideas. In the ESS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, analyzing data, and constructing explanations and designing solutions; and to use these practices to demonstrate understanding of the core ideas.

New Jersey Student Learning Standards
(Please Bold all Climate related standards met throughout all Units)

New Jersey Student Learning Standards: Science

- **MS-ESS1 Earth's Place in the Universe**

Interdisciplinary Connections:

- **English language Arts**
- **Mathematics**
- **Social Studies**
- **Technology**
- **Visual and Performing Arts**

Connections to other DCIs in grades 6–8:

- MS.PS2.A (MS-ESS1-1), (MS-ESS1-2)
- MS.PS2.B (MS-ESS1-1), (MS-ESS1-2)
- MS.LS4.A (MS-ESS1-4)
- MS.LS4.C (MS-ESS1-4)
- MS.ESS2.A (MS-ESS1-3)

Articulation of DCIs across grade levels:

- 3.PS2.A (MS-ESS2-4), (MS-ESS2-6)
- 3.LS4.A MS-ESS2-3)
- 3.PS2.A (MS-ESS1-1), (MS-ESS1-2)
- 3.LS4.A (MS-ESS1-4)
- 3.LS4.C (MS-ESS1-4)
- 4.ESS1.C (MS-ESS1-4)
- 5.PS2.B (MS-ESS1-1), (MS-ESS1-2)
- 5.ESS1.A (MS-ESS1-2)
- 5.ESS1.B (MS-ESS1-1), (MS-ESS1-2), (5-ESS1-3)
- HS.PS1.C (MS-ESS1-4)
- HS.PS2.A (MS-ESS1-1), (MS-ESS1-2)
- HS.PS2.B (MS-ESS1-1), (MS-ESS1-2)
- HS.LS4.A (MS-ESS1-4)
- HS.LS4.C (MS-ESS1-4)
- HS.ESS1.A (MS-ESS1-2)
- HS.ESS1.B (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3)
- HS.ESS1.C (MS-ESS1-4) • HS.ESS2.A (MS-ESS1-3), (MS-ESS1-4)

Connections to NJSLS – English Language Arts

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5) • RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3), (MS-ESS1-4)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS1-3)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims

and evidence, and add interest. (MS-ESS1-1), (MS-ESS1-2)

Connections to NJSLS – Mathematics
MP.2 Reason abstractly and quantitatively. (MS-ESS1-3)

MP.4 Model with mathematics. (MS-ESS1-1), (MS-ESS1-2)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4)

7.EE.B.6 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-2),

Performance Expectations

ESS1:

MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]

MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.]

MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary:

Assessment does not include recalling the names of specific periods or epochs and events within them.]

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.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

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.

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.

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3)
- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.(MS-ESS1-1)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

ESS1.C: The History of Planet Earth

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history . Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1- 4)

Unit 1 Assessments

Formative Assessments:
Exit tickets; teacher produced rubrics; student self checkoff rubric; three fact fold chart; conversations with students about their thinking
Index Card/Summaries/Questions: Periodically, distribute index cards and ask students to write on both sides, with these instructions: (Side 1) Based on our study of (unit topic), list a big idea that you understand and word it as a summary statement. (Side 2) Identify something about (unit topic) that you do not yet fully understand and word it as a statement or question.
Hand Signals: Ask students to display a designated hand signal to indicate their understanding of a specific concept, principal, or process: - I understand_____ and can explain it (e.g., thumbs up). - I do not yet understand _____ (e.g., thumbs down). - I'm not completely sure about _____ (e.g., wave hand).
One Minute Essay: A one-minute essay question (or one-minute question) is a focused question with a specific goal that can, in fact, be answered within a minute or two.
Analogy Prompt: Present students with an analogy prompt: (A designated concept, principle, or process) is like _____ because _____.
Web or Concept Map: Any of several forms of graphical organizers which allow learners to perceive relationships between concepts through diagramming key words representing those concepts. http://www.graphic.org/concept.html
Additional Formative Assessments:
Checklists
Observation
Round Robin Charts
Strategic Questioning
Misconception Check
Laboratory Activity
Pair share activity
Exit ticket/cards
List 10 Things
Reflection Journals
Summative Assessments:
Selected response items: Multiple choice, True/false, Matching, Short answer, Fill in the blank, One or two sentence response, Extended written response
Performance assessment: Laboratory activities, models, various projects End-of-unit or -chapter tests End-of-term or -semester exams
Benchmark: ELA Research Based Benchmark Interim Assessments
Alternative:
Self Selected Science Projects
Group Collaboration Projects
Concept Map
Demonstration Stations
Powerpoint/Google Slides

Unit 2 Overview: Earth's Systems

Unit 2 Summary:

The performance expectations in ESS2: Earth's Systems, help students formulate an answer to questions such as: "*How do the materials in and on Earth's crust change over time, How does the movement of tectonic plates impact the surface of Earth, How does water influence weather, circulate in the oceans, and shape Earth's surface, What factors interact and influence weather, and How have living organisms changed the Earth and how have Earth's changing conditions impacted living organisms?*" The ESS2 Disciplinary Core Idea from the NRC Framework is broken down into five sub-ideas: Earth materials and systems, plate tectonics and large-scale system interactions, the roles of water in Earth's surface processes, weather and climate, and biogeology. Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Of special importance in both topics are the ways that geoscience processes provide resources needed by society but also cause natural hazards that present risks to society; both involve technological challenges, for the identification and development of resources. Students develop understanding of the factors that control weather. A systems approach is also important here, examining the feedbacks between systems as energy from the sun is transferred between systems and circulates though the ocean and atmosphere. The crosscutting concepts of patterns, cause and effect, scale proportion and quantity, systems and system models, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS2 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, and constructing explanations; and to use these practices to demonstrate understanding of the core ideas.

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science

- **MS- ESS2- Earth's Systems**

Interdisciplinary Connections:

- **English language Arts**
- **Mathematics**
- **Social Studies**
- **Technology**
- **Visual and Performing Arts**

Connections to other DCIs in this grade-band:

- MS.PS1.A (MS-ESS2-1),(MS-ESS2-4),(MS-ESS2-5);
- MS.PS1.B (MS-ESS2-1),(MS-ESS2-2);
- MS.PS2.A (MS-ESS2-5),(MS-ESS2-6);
- MS.PS2.B (MS-ESS2-4);
- MS.PS3.A (MS-ESS2-4),(MS-ESS2-5);
- MS.PS3.B (MS-ESS2-1),(MS-ESS2-5),(MS-ESS2-6);
- MS.PS3.D (MS-ESS2-4);
- MS.PS4.B (MS-ESS2-6);
- MS.LS2.B (MSESS2-1),(MS-ESS2-2);
- MS.LS2.C (MS-ESS2-1);
- MS.LS4.A (MS-ESS2-3);
- MS.ESS1.B (MS-ESS2-1);
- MS.ESS3.C (MS-ESS2-1)

Articulation of DCIs across grade-bands:

- 3.PS2.A (MS-ESS2-4),(MS-ESS2-6);
- 3.LS4.A (MS-ESS2-3);
- 3.ESS2.D (MS-ESS2-5),(MS-ESS2-6);
- 3.ESS3.B (MS-ESS2-3);
- 4.PS3.B (MS-ESS2- 1),(MS-ESS2-4);
- 4.ESS1.C (MS-ESS2-2),(MS-ESS2-3);
- 4.ESS2.A (MS-ESS2-1),(MS-ESS2-2);
- 4.ESS2.B (MS-ESS2-3);
- 4.ESS2.E (MS-ESS2-2);
- 4.ESS3.B (MS-ESS2-3);
- 5.PS2.B (MSESS2-4);
- 5.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-5),(MS-ESS2-6);
- 5.ESS2.C (MS-ESS2-4);
- HS.PS1.B (MS-ESS2-1);
- HS.PS2.B (MS-ESS2-4),(MS-ESS2-6);
- HS.PS3.B (MS-ESS2- 1),(MS-ESS2-4);
- HS.PS3.D (MS-ESS2-2),(MS-ESS2-6);
- HS.PS4.B (MS-ESS2-4);
- HS.LS1.C (MS-ESS2-1);
- HS.LS2.B (MS-ESS2-1),(MS-ESS2-2);
- HS.LS4.A (MS-ESS2-3);
- HS.LS4.C (MSESS2-3);

- HS.ESS1.B (MS-ESS2-6);
- HS.ESS1.C (MS-ESS2-2),(MS-ESS2-3);
- HS.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-4),(MS-ESS2-6);
- HS.ESS2.B (MS-ESS2-2),(MSESS2-3);
- HS.ESS2.C (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5);
- HS.ESS2.D (MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5),(MS-ESS2-6);
- HS.ESS2.E (MS-ESS2-1),(MS-ESS2-2);
- HS.ESS3.D (MS-ESS2-2)

ELA/Literacy –
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS2-3)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3),(MS-ESS2-5)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS2-5)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1),(MS-ESS2-2),(MSESS2-6)

Mathematics –
MP.2 Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-5)

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS2-2),(MS-ESS2-3)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS2-2),(MS-ESS2-3)

Performance Expectations

MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]

MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]

MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]

MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

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.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

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.

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.

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)

ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MSESS2-5)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)

ESS2.D: Weather and Climate

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)

- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)

Unit 2 Assessments

Formative Assessments:
Exit tickets; teacher produced rubrics; student self checkoff rubric; three fact fold chart; conversations with students about their thinking; CER
Index Card/Summaries/Questions: Periodically, distribute index cards and ask students to write on both sides, with these instructions: (Side 1) Based on our study of (unit topic), list a big idea that you understand and word it as a summary statement. (Side 2) Identify something about (unit topic) that you do not yet fully understand and word it as a statement or question.
Hand Signals: Ask students to display a designated hand signal to indicate their understanding of a specific concept, principal, or process: - I understand_____ and can explain it (e.g., thumbs up). - I do not yet understand _____ (e.g., thumbs down). - I'm not completely sure about _____ (e.g., wave hand).
One Minute Essay: A one-minute essay question (or one-minute question) is a focused question with a specific goal that can, in fact, be answered within a minute or two.
Analogy Prompt: Present students with an analogy prompt: (A designated concept, principle, or process) is like _____ because _____.
Web or Concept Map: Any of several forms of graphical organizers which allow learners to perceive relationships between concepts through diagramming key words representing those concepts. http://www.graphic.org/concept.html
Additional Formative Assessments:
Checklists
Observation
Round Robin Charts
Strategic Questioning
Misconception Check
Laboratory Activity
Pair share activity
Exit ticket/cards
List 10 Things
Reflection Journals
Summative Assessments:
Selected response items: Multiple choice, True/false, Matching, Short answer, Fill in the blank, One or two sentence response, Extended written response
Performance assessment: Laboratory activities, models, various projects End-of-unit or -chapter tests End-of-term or -semester exams
Benchmark: ELA Research Based Benchmark Interim Assessments
Alternative:
Self Selected Science Projects
Group Collaboration Projects
Concept Map
Demonstration Stations
Powerpoint/Google Slides

Unit 3 Overview: Earth and Human Activity

Unit 3 Summary:

The performance expectations in ESS3: Earth and Human Activity help students formulate an answer to questions such as: "*How is the availability of needed natural resources related to naturally occurring processes, How can natural hazards be predicted, How do human activities affect Earth systems, How do we know our global climate is changing?*" The ESS3 Disciplinary Core Idea from the NRC Framework is broken down into four sub-ideas: natural resources, natural hazards, human impact on Earth systems, and global climate change. Students understand the ways that human activities impacts Earth's other systems. Students use many different practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of their development. The crosscutting concepts of patterns, cause and effect, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS3 performance expectations, students are expected to demonstrate proficiency in asking questions, developing and using models, analyzing and interpreting data, constructing explanations and designing solutions and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science

- **MS- ESS3- Earth and Human Activity**

Interdisciplinary Connections:

- **English language Arts**
- **Mathematics**
- **Social Studies**
- **Technology**
- **Visual and Performing Arts**

Connections to other DCIs in this grade-band:

- MS.PS1.A (MS-ESS3-1);
- MS.PS1.B (MS-ESS3-1);
- MS.PS3.A (MS-ESS3-5);
- MS.PS3.C (MS-ESS3-2);
- MS.LS2.A (MS-ESS3-3),(MS-ESS3-4);
- MS.LS2.C (MS-ESS3-3),(MS-ESS3-4);
- MS.LS4.D (MS-ESS3-3),(MS-ESS3-4);
- MS.ESS2.D (MS-ESS3-1)

Articulation of DCIs across grade-bands:

- 3.LS2.C (MS-ESS3-3),(MS-ESS3-4);
- 3.LS4.D (MS-ESS3-3),(MS-ESS3-4);
- 3.ESS3.B (MS-ESS3-2);
- 4.PS3.D (MS-ESS3-1);
- 4.ESS3.A (MS-ESS3-1);
- 4.ESS3.B (MS-ESS3-2);
- 5.ESS3.C (MS-ESS3-3),(MS-ESS3-4);
- HS.PS3.B (MS-ESS3-1),(MS-ESS3-5);
- HS.PS4.B (MS-ESS3-5);
- HS.LS1.C (MS-ESS3-1);
- HS.LS2.A (MS-ESS3-4);
- HS.LS2.C(MS-ESS3-3),(MS-ESS3-4);
- HS.LS4.C (MS-ESS3-3),(MS-ESS3-4);
- HS.LS4.D (MS-ESS3-3),(MS-ESS3-4);
- HS.ESS2.A (MS-ESS3-1),(MS-ESS3-5);
- HS.ESS2.B (MS-ESS3-1),(MS-ESS3-2);
- HS.ESS2.C (MS-ESS3-1),(MS-ESS3-3);
- HS.ESS2.D (MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-5);
- HS.ESS2.E (MS-ESS3-3),(MS-ESS3-4); HS.ESS3.A (MS-ESS3-1),(MS-ESS3-4);
- HS.ESS3.B (MS-ESS3-2);
- HS.ESS3.C (MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5);
- HS.ESS3.D (MS-ESS3-2);(MS-ESS3-3),(MS-ESS3-5)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-4),(MS-ESS3-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2)

WHST.6-8.1 Write arguments focused on discipline content. (MS-ESS3-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1),(MS-ESS3-4)

Mathematics –
MP.2 Reason abstractly and quantitatively. (MS-ESS3-2),(MS-ESS3-5)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3),(MS-ESS3-4)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS3-3),(MS-ESS3-4)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
(MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
(MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5)

Performance Expectations

MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically nonrenewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are

not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

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).]

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.]

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused climate change 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.]

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.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

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.

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.

Disciplinary Core Ideas

ESS3.A: Natural Resources

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

ESS3.B: Natural Hazards

- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)

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)
- 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. (MSESS3-3),(MS-ESS3-4)

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)

Unit 3 Assessments

Formative Assessments:
Exit tickets; teacher produced rubrics; student self checkoff rubric; three fact fold chart; conversations with students about their thinking; CER
Index Card/Summaries/Questions: Periodically, distribute index cards and ask students to write on both sides, with these instructions: (Side 1) Based on our study of (unit topic), list a big idea that you understand and word it as a summary statement. (Side 2) Identify something about (unit topic) that you do not yet fully understand and word it as a statement or question.
Hand Signals: Ask students to display a designated hand signal to indicate their understanding of a specific concept, principal, or process: - I understand_____ and can explain it (e.g., thumbs up). - I do not yet understand _____ (e.g., thumbs down). - I'm not completely sure about _____ (e.g., wave hand).
One Minute Essay: A one-minute essay question (or one-minute question) is a focused question with a specific goal that can, in fact, be answered within a minute or two.
Analogy Prompt: Present students with an analogy prompt: (A designated concept, principle, or process) is like _____ because _____.
Web or Concept Map: Any of several forms of graphical organizers which allow learners to perceive relationships between concepts through diagramming key words representing those concepts.
http://www.graphic.org/concept.html
Additional Formative Assessments:
Checklists
Observation
Round Robin Charts

Strategic Questioning
Misconception Check
Laboratory Activity
Pair share activity
Exit ticket/cards
List 10 Things
Reflection Journals
Summative Assessments:
Selected response items: Multiple choice, True/false, Matching, Short answer, Fill in the blank, One or two sentence response, Extended written response
Performance assessment: Laboratory activities, models, various projects End-of-unit or -chapter tests End-of-term or -semester exams
Benchmark: ELA Research Based Benchmark Interim Assessments
Alternative:
Self Selected Science Projects
Group Collaboration Projects
Concept Map
Demonstration Stations
Powerpoint/Google Slides

Supplemental Materials/References/Links
Generation Genius **IXL** **FOSS Modules** **https://www.nextgenscience.org/** **Prentice Hall Science Explorer**