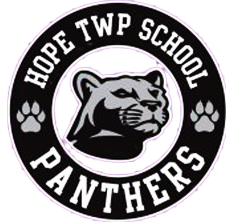# Belvidere Clusterwide Curriculum

Science

7th 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: Molecules to Organisms: Structure and Processes	12 Weeks	1. How can one explain the ways cells contribute to the function of living organisms? 2. How do organisms live, grow, respond to their environment and reproduce?
Unit 2: Ecosystems: Interactions, Energy, and Dynamics	10 Weeks	1. How (and why) do organisms interact with their environment and what are the effects of these interactions?
Unit 3: Heredity: Inheritance and Variation of Traits	8 Weeks	1. How do living organisms pass traits from one generation to the next? 2. How can individuals of the same species and even siblings have different characteristics?
Unit 4: Biological Evolution: Unity and Diversity	10 Weeks	1. How do organisms change over time in response to changes in the environment? 2. How can there be so many similarities among organisms yet so many different kinds of plants, animals and microorganisms?
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.7.1. Demonstrate command of the system and structure of the English language when writing or speaking
- L.KL.7.2. Use knowledge of language and its conventions when writing, speaking, reading, or listening.
- L.VL.7.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, including technical meanings, choosing flexibly from a range of strategies.
- L.VI.7.4. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

Reading Domain:
- RL.CR.7.1. Cite several pieces of 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.7.1. Cite several pieces of 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.7.2. Determine a theme in a literary text (e.g., stories, plays or poetry) and explain how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
- RI.CI.7.2. Determine a central idea in an informational text and explain how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
- RL.IT.7.3. Analyze how particular elements of a text interact including how particular lines of dialogue or incidents in a story or drama propel the action, reveal aspects of a character, or provoke a decision.
- RI.IT.7.3. Analyze how particular elements of a text interact including how a text makes connections and distinctions among individuals, events, and ideas (e.g., through comparisons, analogies, or categories).

- RL.TS.7.4. Analyze the structure an author uses to organize a text and how it contributes to the text as a whole, including how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning.
- RI.TS.7.4. Analyze the structure an author uses to organize a text and how it contributes to the text as a whole, including using knowledge of text structures (e.g., cause-effect, proposition-support) and genre features (e.g., graphics, captions, indexes) to organize and analyze important information.
- RL.PP.7.5. Determine how an author conveys or develops perspective or purpose in a text through contrasting the points of view of different characters or narrators in a text.
- RI.PP.7.5. Determine how an author conveys or develops perspective or purpose in a text through distinguishing their position from that of others using evidence.
- RL.MF.7.6. Compare and contrast texts (e.g., a written story, drama, or poem) to its audio, filmed, staged, or multimedia version and analyze the unique qualities of different mediums, including the effects of techniques unique to each medium (e.g., lighting, sound, color, or camera focus and angles in a film).
- RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information.
- RI.AA.7.7. Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
- RL.CT.7.8. Compare and contrast a fictional portrayal of an event, time, place, or character and a historical or scientific account of the same period or event as a means of understanding how authors of fiction use or alter history and/or events.
- RI.CT.7.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) how two or more authors writing informational texts about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts

Writing Domain: (see substandards for related sub strands)
- W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
- W.IW.7.2. 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.7.3. Write narratives to develop real or imagined experiences or events using effective technique
- W.WP.7.4. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning; flexibly making editing and revision choices and sustaining effort to complete complex writing tasks; and focusing on how well purpose and audience have been addressed.
- W.WR.7.5. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
- W.SE.7.6. 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.
- W.RW.7.7. 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.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- SL.II.7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- SL.ES.7.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.
- SL.PI.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.UM.7.5. Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

- SL.AS.7.6. 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

- **<u>Gifted and Talented</u>**
- 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_____

- **<u>504</u>**
- 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
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- 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: Molecules to Organisms: Structure and Processes

Unit 1 Summary:

Students can gather information and use this information to support explanations of the structure and function relationship of cells. They can communicate understanding of cell theory. They have a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. The understanding of cells provides a context for the plant process of photosynthesis and the movement of matter and energy needed for the cell. Students can construct an explanation for how environmental and genetic factors affect growth of organisms. They can connect this to the role of animal behaviors in reproduction of animals as well as the dependence of some plants on animal behaviors for their reproduction. Crosscutting concepts of cause and effect, structure and function, and matter and energy are called out as organizing concepts for the core ideas about processes of living organisms.

New Jersey Student Learning Standards: Science
- **MS- LS1 From Molecules to Organisms: Structure and Processes**

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

Connections to other DCIs in this grade-band:
- MS.PS1.B (MS-LS1-6),(MS-LS1-7);
- MS.LS2.A (MS-LS1-4),(MS-LS1-5);
- MS.LS3.A (MS-LS1-2);
- MS.ESS2.A (MS-LS1-6)

Common Core State Standards Connections:
ELA/Literacy –
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3),(MS-LS1-4),(MS-LS1-5),(MS-LS1-6)

RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5),(MS-LS1-6)

RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MSLS1-3),(MS-LS1-4)

WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-3),(MS-LS1-4)

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-LS1-5),(MS-LS1-6)

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-LS1-1)

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-LS1-8) WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5),(MS-LS1-6)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2),(MS-LS1-7)

Mathematics –

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
(MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-6)

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MSLS1-4),(MS-LS1-5)

6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5)

Performance Expectations

MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]

 MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]

 MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]

MS-LS1-4 Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small

MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] New Jersey Department of Education January 2022 Page 114 of 200 [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

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

LS1.A: Structure and Function
- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

LS1.B: Growth and Development of Organisms
- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

LS1.C: Organization for Matter and Energy Flow in Organisms
- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1- 6)
- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

LS1.D: Information Processing
- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1- 8)

PS3.D: Energy in Chemical Processes and Everyday Life
- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6)
- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)

Unit 1 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 2 Overview: Ecosystems: Interactions, Energy, and Dynamics

Unit 2 Summary:
Students can analyze and interpret data, develop models, and construct arguments and demonstrate a deeper understanding of resources and the cycling of matter and the flow of energy in ecosystems. They can also study patterns of the interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on population. They evaluate competing design solutions for maintaining biodiversity and ecosystem services.

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science
    ● **MS-LS2 Interactions, Energy, and Dynamic Relationships in Ecosystems**
 	
Interdisciplinary Connections:
    ● **English language Arts**
    ● **Mathematics**
    ● **Social Studies**
    ● **Technology**

- **Visual and Performing Arts**

Connections to other DCIs in this grade-band:
- MS.PS1.B (MS-LS2-3);
- MS.LS1.B (MS-LS2-2);
- MS.LS4.C (MS-LS2-4);
- MS.LS4.D (MS-LS2-4);
- MS.ESS2.A (MS-LS2-3),(MS-LS2-4);
- MS.ESS3.A (MS-LS2-1),(MS-LS2-4);
- MS.ESS3.C (MS-LS2-1),(MS-LS2-4),(MS-LS2-5)

Articulation across grade-bands:
- 1.LS1.B (MS-LS2-2);
- 3.LS2.C (MS-LS2-1),(MS-LS2-4);
- 3.LS4.D (MS-LS2-1),(MS-LS2-4);
- 5.LS2.A (MS-LS2-1),(MS-LS2-3);
- 5.LS2.B (MS-LS2-3);
- HS.PS3.B (MS-LS2-3);
- HS.LS1.C (MS-LS2-3);
- HS.LS2.A (MS-LS2-1),(MS-LS2-2),(MS-LS2-5);
- HS.LS2.B (MS-LS2-2),(MS-LS2-3);
- HS.LS2.C (MS-LS2-4),(MS-LS2-5);
- HS.LS2.D (MSLS2-2);
- HS.LS4.C (MS-LS2-1),(MS-LS2-4);
- HS.LS4.D (MS-LS2-1),(MS-LS2-4),(MS-LS2-5);
- HS.ESS2.A (MS-LS2-3);
- HS.ESS2.E (MS-LS2-4);
- HS.ESS3.A (MS-LS2-1),(MS-LS2-5);
- HS.ESS3.B (MS-LS2-4);
- HS.ESS3.C (MS-LS2-4),(MS-LS2-5);
- HS.ESS3.D (MS-LS2-5)

Common Core State Standards Connections:
ELA/Literacy –
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
(MS-LS2-1),(MS-LS2-2),(MS-LS2-4)

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-LS2-1)

RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)

RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-4),(MS-LS2-5)

WHST.6-8.1 Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4)

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-LS2-2)

WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2),(MS-LS2-4)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS2-2)

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS2-2)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS2-3)

Mathematics –

MP.4 Model with mathematics. (MS-LS2-5)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5)

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS2-3)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS2-2)

Performance Expectations

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

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

LS2.A: Interdependent Relationships in Ecosystems
- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2- 1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems
- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)

- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)

LS4.D: Biodiversity and Humans
- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)

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. (secondary to MS-LS2-5)

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 _____.
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http://www.graphic.org/concept.html
Additional Formative Assessments:
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Observation
Round Robin Charts
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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: Heredity: Inheritance and Variation of Traits

Unit 3 Summary:
Students can use models to describe ways gene mutations and sexual reproduction contribute to genetic variation. Crosscutting concepts of cause and effect and structure and function provide students with a deeper understanding of how gene structure determines differences in the functioning of organisms

New Jersey Student Learning Standards

New Jersey Student Learning Standards: Science
- **MS-LS3 Heredity: Inheritance and Variation of Traits**

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

Connections to other DCIs in this grade-band:
- MS.LS1.A (MS-LS3-1);
- MS.LS4.A (MS-LS3-1)

Articulation across grade-bands:

- 3.LS3.A (MS-LS3-1),(MS-LS3-2);
- 3.LS3.B (MS-LS3-1),(MS-LS3-2);
- HS.LS1.A (MS-LS3-1);
- HS.LS1.B (MS-LS3-1),(MS-LS3-2);
- HS.LS3.A (MS-LS3- 1),(MS-LS3-2);
- HS.LS3-B (MS-LS3-1),(MS-LS3-2)

Common Core State Standards Connections:
ELA /Literacy –

RST .6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
(MS-LS3-1),(MS-LS3-2)

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
(MS-LS3-1),(MS-LS3-2)

RST .6-8.7 Integrate quantitative or technical information expressed in words in a text with a v ersion of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
(MS-LS3-1),(MS-LS3-2)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1),(MS-LS3-2)

Mathematics –

MP.4 Model with mathematics. (MS-LS3-2)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS3-2)

Performance Expectations

MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

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

LS1.B: Growth and Development of Organisms
- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MSLS3-2)

LS3.A: Inheritance of Traits
- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

LS3.B: Variation of Traits
- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

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).
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http://www.graphic.org/concept.html
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Laboratory Activity
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List 10 Things
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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 4 Overview: Biological Evolution: Unity and Diversity

Unit 4 Summary:
Students can construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They can use ideas of genetic variation in a population to make sense of organisms surviving and reproducing, hence passing on the traits of the species. They are able to use fossil records and anatomical similarities of the relationships among organisms and species to support their understanding. Crosscutting concepts of patterns and structure and function contribute to the evidence students can use to describe biological evolution.

New Jersey Student Learning Standards: Science
- **MS- LS4 Biological Evolution: Unity and Diversity**

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

Connections to other DCIs in this grade-band:
- MS.LS2.A (MS-LS4-4),(MS-LS4-6);
- MS.LS2.C (MS-LS4-6);
- MS.LS3.A (MS-LS4-2),(MS-LS4-4);
- MS.LS3.B (MS-LS4-2),(MS-LS4-4),(MSLS4-6);
- MS.ESS1.C (MS-LS4-1),(MS-LS4-2),(MS-LS4-6);
- MS.ESS2.B (MS-LS4-1)

Articulation across grade-bands:
- 3.LS3.B (MS-LS4-4);
- 3.LS4.A (MS-LS4-1),(MS-LS4-2);
- 3. LS4.B (MS-LS4-4);
- 3.LS4.C (MS-LS4-6);
- HS.LS2.A (MS-LS4-4),(MS-LS4-6);
- HS.LS2.C (MS-LS4-6);
- HS.LS3.B (MS-LS4-4),(MS-LS4-5),(MS-LS4-6);
- HS.LS4.A (MS-LS4-1),(MS-LS4-2),(MS-LS4-3);
- HS.LS4.B (MS-LS4-4),(MS-LS4-6);
- HS.LS4.C (MS-LS4-4),(MS-LS4- 5),(MS-LS4-6);
- HS.ESS1.C (MS-LS4-1),(MS-LS4-2)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1),(MSLS4-2),(MS-LS4-3),(MS-LS4-4),(MS-LS4-5)

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-LS4-1),(MS-LS4-3)

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-LS4-3),(MS-LS4-4)

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-LS4-2),(MS-LS4-4)

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-LS4-5)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2),(MS-LS4-4)

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2),(MS-LS4-4)

Mathematics –

MP.4 Model with mathematics. (MS-LS4-6)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6)

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-LS4-1),(MS-LS4-2)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6)

Performance Expectations

MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

MS-LS4-3 Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

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

LS4.A: Evidence of Common Ancestry and Diversity
- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)
- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
- Comparison of the embryological development of different species also reveals similarities that show

relationships not evident in the fully-formed anatomy. (MS-LS4-3)

LS4.B: Natural Selection
- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)
- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

LS4.C: Adaptation
- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

Unit 4 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.

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