**Lakewood Public School District Curriculum Guide**

| Grade: 8 | Content Area: Science |
|---|---|

| |
|---|
| **Original Adoption:** Original Adoption: 2023 NJSLS English Language Arts and English as a Second Language (8-21-24); Math NJSLS Mathematics (8-21-24); 2020 NJSLS Science, Social Studies, Career Readiness, Life Literacies & Key Skills, Computer Design & Thinking, Visual & Performing Arts, World Language, Comprehensive Health and Physical Education (5-11-22) |
| **Created By:** |

| Recommended Pacing Guide | |
|---|---|
| **Unit 1:** Microbiome | 20 days |
| **Unit 2:** Metabolism | 20 days |
| **Unit 3:** Metabolism Engineering | 11 days |
| **Unit 4:** Traits and Reproduction | 19 days |
| **Unit 5:** Natural Selection | 23 days |
| **Unit 6:** Natural Selection Engineering | 11 days |
| **Unit 7:** Evolution History | 20 days |
| **Unit 8:** Population and Resources | 20 days |
| **Unit 9:** Matter and Energy in Ecosystems | 20 days |

## Alignment with State Mandates

The following colors are used throughout this document to indicate areas in which the curriculum is aligned with the following NJSA requirements:

- Holocaust and genocides (N.J.S.A. 18A:35-28)
- History and contributions of African-Americans (Amistad Law) (N.J.S.A. 18A:35-4.43)
- Highlight and promote diversity and inclusion (Diversity & Inclusion Law) (N.J.S.A. 18A:35-4.36a)
- History of disabled and LGBT persons included in middle and high school curriculum (Section 18A:35-4.35 )
- Climate Change - to prepare students to understand how and why climate change happens, the impact it has on our local and global communities and to act in informed and sustainable ways. Please click here for specific examples (by subject).

**Lakewood Public School District Curriculum Guide**

| Grade: 8 | Content Area: Science |
|---|---|

| Unit 1: Microbiome | Duration: 20 days |
|---|---|

| New Jersey Student Learning Standards | |
|---|---|
| **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. |
| **MS-LS1-2** | Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. |
| **MS-LS1-3** | Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells |
| **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. |
| **MS-LS2-2** | Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. |

| Science and Engineering Practices | Discipline Core Ideas/Unit Enduring Understandings | Crosscutting Concepts |
|---|---|---|
| **Practice 1: Asking Questions**<br>● As students investigate single-celled organisms, they analyze data in order to make explanations about the role that bacteria play in the human microbiome. They also have many opportunities to pose their own questions. In particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they read science articles.<br><br>**Practice 2: Developing and Using Models:**<br>● In order to learn about the tiny microorganisms that inhabit the human microbiome, students use the Scale Tool. This digital model allows students to explore and | **LS1.A: Structure and Function:**<br>● All living things are made up of cells. A cell 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)<br>● 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)<br>● 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) | **Scale, Proportion, and Quantity**<br>● Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)<br><br>**Systems and System Models**<br>● Systems may interact with other systems; they may have subsystems and be a part of larger complex systems. (MS-LS1-3)<br><br>**Structure and Function**<br>● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they |

compare the relative sizes of different objects in order to develop a conceptual understanding of scale. Students also create their own scale drawings of microorganisms

**Practice 3: Planning and Carrying Out Investigations:**

- Students carry out a simulated investigation of the bacteria that live on the human hand to gather observable evidence about the microorganisms on the human body that are too small to see.

**Practice 4: Analyzing and Interpreting Data.**

- Students analyze a series of pie charts representing the changing microbiome of a case study patient.

**Practice 5: Using Mathematics and Computational Thinking:**

- Using the digital Scale Tool, students explore the concept of scale in comparing the sizes of molecules, cells, and other objects.

**Practice 6: Constructing Explanations:**

- As students explain the roles of both helpful and harmful bacteria in the human microbiome, they learn about scientific explanations and have multiple opportunities to construct increasingly complex explanations (and defend them through argumentation) over the course of the unit.

**Practice 7: Engaging in Argument from Evidence**

- Students receive instruction about the structure of a

**LS2.A: Interdependent Relationships in Ecosystems:**

- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, which consequently constrains their growth and reproduction. (MS-LS2-1)
- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (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)

function. (MS-LS1-2)

**Connections to Engineering, Technology, and Applications of Science**
**Interdependence of Science, Engineering, and Technology**

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1)

**Connections to Nature of Science**
**Science is a Human Endeavor**

- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)

| | | |
|---|---|---|
| scientific argument and are supported in evaluating evidence, engaging in scientific reasoning, and producing both oral and written arguments.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information**<br>● Students are introduced to Active Reading, an approach to obtaining information from science texts, and have multiple opportunities to engage in this practice. Students also evaluate evidence to determine its relevance to a particular claim. | | |

| **New Jersey Social and Emotional Competencies and Sub-Competencies** | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals.<br>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | ● Recognize and identify the thoughts, feelings, and perspectives of others.<br>● Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>● Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>● Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | ● Develop, implement, and model effective problem-solving and critical thinking skills.<br>● Identify the consequences associated with one's actions in order to make constructive choices.<br>● Evaluate personal, ethical, safety, and civic impact of decisions. |

| | |
|---|---|
| **Relationship Skills** | • Establish and maintain healthy relationships.<br>• Utilize positive communication and social skills to interact effectively with others.<br>• Identify ways to resist inappropriate social pressure.<br>• Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>• Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |
| **MP5** | Use appropriate tools strategically. |
| **MP6** | Attend to precision. |
| **8.EE.4** | Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. |

**Lakewood Public School District Curriculum Guide**

| Grade: 8 | Content Area: Science |
|---|---|

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| Career Readiness, Life Literacies & Key Skills | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

| Evidence of Student Learning |
|---|

**Lakewood Public School District Curriculum Guide**

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| **Formative Tasks:**<br>● Teacher observations<br>● Class discussions<br>● Whiteboard/Communicators<br>● On-the-Fly Assessments<br>● Daily classwork<br>● Checks for understanding<br>● Clipboard Assessment Tool<br>● Critical Juncture Assessment<br>● Crosscutting Concept Tracker | **Alternative Assessments:**<br>● Oral assessments<br>● Teacher-Created Projects<br>● https://www.khanacademy.org/<br>● Completion of webquests<br>● On-Line Laboratory activities<br>● Online assessment activities example:<br>○ Kahoot<br>○ Quizizz |
| **Summative Assessments:**<br>● Unit Tests<br>● Midterm Exam<br>● Final Exam<br>● Chapter/Unit Test<br>● Writing Assignments<br>● Presentations<br>● Laboratory Reports/Practical<br>● Unit Projects | **Benchmark Assessments:**<br>● Quarterly Benchmarks<br>● Beginning/End of Year Assessment<br>● Midterm Assessment<br>● Unit Common Assessment |

| **Knowledge & Skills** | |
|---|---|
| **Enduring Understandings:**<br>● Many organisms are microscopic—so small that they cannot be seen with the naked eye.<br>● All living things are made of cells.<br>● Almost all cells are microscopic.<br>● Even though they are both too small to see, cells are much bigger than molecules.<br>● The human microbiome contains approximately 100 trillion microorganisms. Most of these are bacteria.<br>● The human body provides an environment (food and space) for bacteria to survive.<br>● A healthy microbiome has various helpful types of bacteria.<br>● An infection of harmful bacteria in the human microbiome can make a person sick.<br>● Antibiotics reduce the number of helpful and harmful bacteria in the microbiome.<br>● Living things with fewer than normal helpful bacteria in their guts can become infected more easily because there is more food and space available for harmful bacteria. | **Essential Questions:**<br>● How can having 100 trillion microorganisms on and in the human body keep us healthy?<br>● How small are the microorganisms that live on and in the human body?<br>● How can fecal transplants cure patients infected with harmful bacteria?<br>● What is the human microbiome?<br>● How is a healthy gut microbiome different from an unhealthy gut microbiome?<br>● How do antibiotics affect the microbiome?<br>● How can fewer than normal bacteria in the gut microbiome affect the overall health of the human body?<br>● How does having a healthy microbiome keep the body healthy? |
| **Content**<br>*Students will know…*<br>● Life science is the study of living things. | **Skills**<br>*Students will be able to …* |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| ● Asking questions is an important part of scientists' work.<br>● Many organisms are microscopic—so small, they cannot be seen with the naked eye.<br>● Science is both a body of knowledge and the processes and practices used to add to that body of knowledge.<br>● All living things are made of cells.<br>● Almost all cells are microscopic.<br>● Cells are typically measured in micrometers, which are one million times smaller than meters.<br>● Even though they are both too small to see, cells are much bigger than molecules.<br>● Molecules are typically measured in nanometers, which are 1000 times smaller than micrometers.<br>● Scientists can use bacterial cultures to gather evidence about microorganisms that are too small to see with the naked eye.<br>● Reading actively means thinking about one's own understanding as one reads.<br>● Most bacteria in the human microbiome are harmless.<br>● Scientists answer questions by using data and information from text.<br>● The human microbiome contains approximately 100 trillion microorganisms. Most of these are bacteria.<br>● The human body provides an environment (food and space) for bacteria to survive.<br>● The purpose of a scientific argument is to convince others, using evidence and reasoning.<br>● A scientific argument begins with a question, includes a claim and evidence, and explains how the evidence supports the claim.<br>● Scientists use relevant evidence to support a claim.<br>● Antibiotics reduce the number of helpful and harmful bacteria in the microbiome.<br>● A healthy microbiome has various helpful types of bacteria.<br>● An infection of harmful bacteria in the human microbiome can make a person sick.<br>● Scientists can only make arguments about things that can be observed and investigated.<br>● Antibiotics reduce the number of helpful and harmful bacteria in the microbiome.<br>● Living things with fewer-than-normal helpful bacteria in their guts can become infected | ● Identify life science as the study of living things and distinguish it from other branches of science.<br>● Generate investigable scientific questions related to living organisms and microscopic life.<br>● Explain why many organisms cannot be seen with the naked eye and describe how scientists study microscopic life.<br>● Describe science as both a body of knowledge and a set of practices used to build that knowledge.<br>● Explain that all living things are made of cells and recognize that most cells are microscopic.<br>● Compare and contrast the relative sizes of cells and molecules using appropriate units (micrometers and nanometers).<br>● Use scale and measurement language to explain why cells are much larger than molecules even though both are invisible to the naked eye.<br>● Describe how scientists use bacterial cultures as evidence to study microorganisms.<br>● Read scientific texts actively by monitoring understanding, identifying key ideas, and using evidence from the text.<br>● Explain that most bacteria in the human microbiome are harmless or helpful.<br>● Use data and information from text to answer scientific questions about microorganisms and the human body.<br>● Describe the human microbiome as a large community of microorganisms living in the body.<br>● Explain how the human body provides food and space that allow bacteria to survive.<br>● Construct a scientific argument that includes a question, a claim, evidence, and reasoning.<br>● Use relevant evidence to support a claim about the human microbiome.<br>Explain how antibiotics affect both helpful and harmful bacteria in the microbiome.<br>● Describe characteristics of a healthy microbiome, including diversity of helpful bacteria.<br>● Explain how harmful bacteria can cause illness when they infect the microbiome.<br>● Explain why scientific arguments must be based on observable and investigable evidence.<br>● Analyze how reducing helpful bacteria can increase the risk of infection by harmful bacteria.<br>● Explain how fecal transplants can restore balance in the gut by limiting food and space for harmful bacteria.<br>● Describe the roles of specific bacteria in supporting immune function and gut protection. |

| | |
|---|---|
| more easily because there is more food and space available for harmful bacteria.<br>● Bacteria from a fecal transplant can fill the space in the gut, which limits available food and space for invading harmful bacteria.<br>● B. fragilis bacteria help the body produce immune cells that can kill invading, harmful bacteria.<br>● L. reuteri bacteria help the body produce mucus that can line the gut and protect it from harmful bacteria.<br>● A scientific argument is convincing when it includes evidence that strongly supports the claim.<br>● In a convincing argument, the connections between the evidence and the claim are made clear.<br>● Scientific values function as criteria in distinguishing between science and nonscience. | ● Evaluate the strength of a scientific argument by examining the quality of evidence and clarity of reasoning.<br>● Explain how scientific values help distinguish science from nonscience. |

| **Core Instructional & Supplemental Materials** | |
|---|---|
| **Suggested Activities/Resources:**<br>● Articles in This Unit<br>○ "Cells"<br>○ "The Human Microbiome"<br>○ "Meet a Scientist Who Studies the Human Microbiome"<br>○ "Salmonella", "C. difficile", "B. fragilis", "L. reuteri", "B. animalis", "C. jejuni", and "E. coli"<br>○ "Viruses: On the Edge of Life" | **Supplemental Materials**<br>● Digital Resources included in each unit<br>○ Using the Scale Tool<br>● Multi-language glossary<br>● Hands-On Flextension:<br>○ Microscopic Evidence of Life |

| **Suggested Accommodations** |
|---|
| **English Language Learners:**<br>● Multi-sensory instruction<br>● Flexible grouping<br>● Small group instruction<br>● Provide peer tutoring<br>● Use a strong student as a "buddy" (does not necessarily have to speak the primary language)<br>● Chunking information<br>● Scaffolded questioning<br>● Academic language support<br>● Vocabulary support<br>● Co-Constructed Word Banks<br>● Anchor charts |

- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**

- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**

- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

**Economically Disadvantaged:**

| **Grade: 8** | **Content Area: Science** |
|---|---|

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| **Unit 2: Metabolism** | **Duration: 20 days** |
|---|---|

| **New Jersey Student Learning Standards** | |
|---|---|
| **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. |
| **MS-LS1-2** | Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. |
| **MS-LS1-3** | Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells |
| **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. |
| **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. |

| Grade: 8 | Content Area: Science |
|---|---|

| Science and Engineering Practices | Discipline Core Ideas/Unit Enduring Understandings | Crosscutting Concepts |
|---|---|---|
| **Practice 1: Asking Questions**<br>● Throughout the unit, students employ the Active Reading approach as they engage with a rich and varied collection of science articles and other forms of text. They are encouraged to ask questions as they read, making note of these questions as they annotate the text.<br><br>**Practice 2: Developing and Using Models:**<br>● Students create a physical model of human body systems and spend extensive time exploring and investigating a simulation that models the human body. They also use a digital modeling tool to create models that show their ideas about body systems and cellular respiration.<br><br>**Practice 3: Planning and Carrying Out Investigations:**<br>● As medical interns working to diagnose a fictional patient, students plan and conduct investigations to figure out how body systems work together to take molecules from the environment and get them, in usable form, to the cells.<br><br>**Practice 4: Analyzing and Interpreting Data:**<br>● The use of the Metabolism Simulation leads students to generate data related to possible diagnoses. Students analyze, interpret, then use this data as evidence when they make their diagnoses. Students again analyze and interpret data in order to apply | **LS1.A: Structure and Function:**<br>● All living things are made up of cells, which are the smallest units 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).<br>● Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.<br>● 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.<br><br>**LS1.C: Organization for Matter and Energy Flow in Organisms:**<br>● 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)<br><br>**LS1.D: Information Processing:**<br>● 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) | **Cause and Effect**<br>● Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)<br><br>**Scale, Proportion, and Quantity**<br>● Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)<br><br>**Systems and System Models**<br>● Systems may interact with other systems; they may have subsystems and be a part of larger complex systems. (MS-LS1-3)<br><br>**Energy and Matter**<br>● Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)<br><br>**Structure and Function**<br>● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)<br><br>**Connections to Engineering, Technology, and Applications of Science**<br>**Interdependence of Science, Engineering, and Technology**<br>● Engineering advances have led to important discoveries in virtually |

| | | |
|---|---|---|
| their understanding about metabolism to a new problem concerning blood doping to improve athletic performance<br><br>**Practice 6: Constructing Explanations:**<br>● Students learn about scientific explanations and have multiple opportunities to make increasingly complex explanations (and defend them through argumentation) over the course of the unit as they explain how body systems work together to get needed molecules to cells for energy release and growth and repair.<br><br>**Practice 7: Engaging in Argument from Evidence:**<br>● Students receive instruction about the structure of a scientific argument and are supported in evaluating evidence, engaging in scientific reasoning, and producing both oral and written arguments.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information:**<br>● Students have multiple opportunities to engage in Active Reading, an approach to obtaining information from science texts. Students also evaluate evidence to determine its relevance to a particular claim. | **PS3.D: Energy in Chemical Processes and Everyday Life:**<br>● Cellular respiration in plants and animals involves 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. (MS-LS1-7) | every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1)<br><br>**Connections to Nature of Science**<br>**Science is a Human Endeavor**<br>● Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3) |

| New Jersey Social and Emotional Competencies and Sub-Competencies | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals.<br>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | ● Recognize and identify the thoughts, feelings, and perspectives of others.<br>● Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>● Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>● Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | ● Develop, implement, and model effective problem-solving and critical thinking skills.<br>● Identify the consequences associated with one's actions in order to make constructive choices.<br>● Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | ● Establish and maintain healthy relationships.<br>● Utilize positive communication and social skills to interact effectively with others.<br>● Identify ways to resist inappropriate social pressure.<br>● Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>● Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |

| | |
|---|---|
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |

| | |
|---|---|
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |
| **MP5** | Use appropriate tools strategically. |
| **MP6** | Attend to precision. |
| **MP7** | Look for and make use of structure. |
| **8.F.5** | Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. |

| **Computer Science & Design Thinking** | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| **Career Readiness, Life Literacies & Key Skills** | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be |

| | |
|---|---|
| | used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

## Evidence of Student Learning

**Formative Tasks:**
- Teacher observations
- Class discussions
- Whiteboard/Communicators
- On-the-Fly Assessments
- Daily classwork
- Checks for understanding
- Clipboard Assessment Tool
- Critical Juncture Assessment
- Crosscutting Concept Tracker

**Alternative Assessments:**
- Oral assessments
- Teacher-Created Projects
- https://www.khanacademy.org/
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
  - Kahoot
  - Quizizz

**Summative Assessments:**
- Unit Tests
- Midterm Exam
- Final Exam
- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Reports/Practical
- Unit Projects

**Benchmark Assessments:**
- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Midterm Assessment
- Unit Common Assessment

## Knowledge & Skills

**Enduring Understandings:**
- A functioning human body has molecules from food (glucose and amino acids) and molecules from air (oxygen) in its cells.
- Cells can only use molecules that are small enough to enter a cell.
- The respiratory system brings in oxygen molecules from the air. These oxygen

**Essential Questions:**
- How do the trillions of cells in the human body get what they need to function, and what do the cells do with the things they absorb?
- Why does Elisa feel tired all the time?
- What does the human body need to function?
- Which molecules do cells need to function?

| | |
|---|---|
| molecules are already small enough to fit into cells.<br>● The digestive system brings in food and breaks it down into smaller molecules, such as glucose and amino acids, that can fit into cells.<br>● The circulatory system transports glucose, oxygen, and amino acid molecules to every cell in the body.<br>● In a functioning human body, body systems work together to deliver glucose, oxygen, and amino acid molecules to the cells in the body.<br>● Systems can work together to form a larger more complex system.<br>● A problem with a body system can result in fewer oxygen, glucose, and/or amino acid molecules getting to the body's cells.<br>● In order to release energy, cells need both glucose and oxygen molecules.<br>● Inside the cell, the atoms that make up glucose and oxygen can be rearranged to make different molecules. This chemical reaction is called cellular respiration and releases energy.<br>● Cells can grow and repair themselves by combining amino acid molecules to form larger protein molecules. This growth and repair requires energy release from cellular respiration. | ● What is happening in Elisa's body that could be preventing molecules from getting to her cells?<br>● How do molecules from food and air get to the cells in the body?<br>● How can having a medical condition affect the delivery of molecules to cells in the body?<br>● How do molecules in the cells of the body release energy?<br>● Which molecules do the cells need to release energy?<br>● How do oxygen and glucose molecules release energy in the cells?<br>● What can happen in the cell as a result of energy released through cellular respiration?<br>● How did the athlete increase his cellular respiration and improve his performance? |
| **Content**<br>*Students will know…*<br>● The body takes in molecules by eating and breathing.<br>● Some of these molecules travel to the cells of the body<br>● A functioning human body has molecules from food (glucose and amino acids) and molecules from air (oxygen) in its cells.<br>● Scientists consider how much data was collected in an investigation when they evaluate whether the investigation provides high-quality evidence.<br>● Cells can only use molecules that are small enough to enter a cell.<br>● The respiratory system brings in oxygen molecules from the air. These oxygen molecules are already small enough to fit into cells.<br>● The digestive system brings in food and breaks it down into smaller molecules, such as glucose and amino acids, that can fit into cells. | **Skills**<br>*Students will be able to …*<br>● Explain how the human body takes in molecules through eating and breathing.<br>● Describe how molecules from food and air travel to cells throughout the body.<br>● Identify glucose, amino acids, and oxygen as essential molecules found in the cells of a functioning human body.<br>● Explain why only molecules small enough can enter cells.<br>● Describe how the respiratory system brings oxygen into the body and delivers it in a usable form for cells.<br>● Explain how the digestive system breaks down food into smaller molecules that can enter cells.<br>● Describe the role of the circulatory system in transporting oxygen, glucose, and amino acids to body cells.<br>● Explain how multiple body systems work together as a larger system to support cellular function.<br>● Use models to represent how molecules move through body systems to reach cells. |

| | |
|---|---|
| ● The circulatory system transports glucose, oxygen, and amino acid molecules to every cell in the body.<br>● Scientists use models to understand the processes that happen inside the human body because they are difficult to observe directly due to being too small or hidden from view.<br>● In a functioning human body, body systems work together to deliver glucose, oxygen, and amino acid molecules to the cells in the body.<br>● Medical conditions can affect the functioning of body systems, resulting in the cells of the body not getting enough of the important molecules they need to function.<br>● Understanding of difficult texts, such as science texts, can be enhanced when you pay attention and ask meaningful questions while reading.<br>● Systems can work together to form a larger more complex system.<br>● With anemia, less oxygen gets into the circulatory system and the cells.<br>● With diabetes, less glucose gets into the cells.<br>● With asthma, less oxygen gets into the respiratory system, the circulatory system, and the cells.<br>● With a pancreas injury, less glucose gets into the circulatory system and the cells.<br>● Scientists create models to express their ideas about how something works.<br>● Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination, and creativity.<br>● A problem with a body system can result in fewer oxygen, glucose, and/or amino acid molecules getting to the body's cells.<br>● A diagnosis in medicine is a form of scientific argumentation in which evidence is used to rule out claims and support the best conclusion.<br>● The body requires energy to function.<br>● In order to release energy, cells in the body need both glucose and oxygen molecules.<br>● Inside the cell, the atoms that make up glucose and oxygen can be rearranged to make different molecules. This chemical reaction is called cellular respiration and releases energy.<br>● Cells can grow and repair themselves by combining amino acid molecules to form larger protein molecules. This growth and repair requires energy release from cellular respiration. | ● Explain why scientists use models to study processes that cannot be directly observed.<br>● Analyze how medical conditions can interfere with the delivery of important molecules to cells.<br>● Compare how different conditions affect the movement of oxygen or glucose in the body.<br>● Use evidence from text and models to explain how anemia, diabetes, asthma, and pancreas injury impact cells.<br>● Demonstrate active reading strategies by asking questions and monitoring understanding while reading science texts.<br>● Explain that the body requires energy to function.<br>● Describe how cells release energy using glucose and oxygen through cellular respiration.<br>● Explain that cellular respiration is a chemical reaction in which atoms are rearranged to form new molecules.<br>● Explain how energy released from cellular respiration supports cell growth and repair.<br>● Analyze how conditions that affect energy release can impact growth and repair in the body.<br>● Explain how increased oxygen availability can increase cellular respiration, especially during exercise.<br>● Describe how blood doping and high-altitude training affect oxygen delivery in the body.<br>● Use evidence to compare claims about blood doping and high-altitude training.<br>● Evaluate the quality of evidence by considering how much data was collected and how it supports a claim.<br>● Construct a scientific argument related to metabolism or body systems using claims, evidence, and reasoning.<br>● Explain how medical diagnoses function as scientific arguments based on evidence.<br>● Discuss how scientists determine certainty and uncertainty in their claims.<br>● Explain why scientists may revise their explanations when presented with new evidence.<br>● Collaborate with peers to discuss evidence and refine understanding of scientific ideas. |

| | |
|---|---|
| ● Conditions that affect energy release in the cells, like diabetes, can also affect the body's ability to grow and repair cells.<br>● Increased cellular respiration can occur when more oxygen is available to the cells of the body.<br>● Some athletes increase the amount of oxygen that can be carried by their circulatory systems through a process called blood doping.<br>● Training at high altitude can also increase the amount of oxygen that can be carried by the circulatory system.<br>● Increased cellular respiration can occur when more oxygen is available to the cells of the body, especially during exercise.<br>● Scientists try to use the highest-quality evidence available when considering and comparing different claims.<br>● Evidence for blood doping can include age of red blood cells and levels of hemoglobin.<br>● High-altitude training can have a similar effect as blood doping, by increasing the number of red blood cells in the body.<br>● Scientists must carefully consider all available evidence before making arguments about a phenomenon.<br>● Scientists can be more or less certain of their claims depending on the evidence they have.<br>● Discussing evidence and ideas with others helps build new understanding.<br>● Scientists can change their minds when presented with convincing evidence. | |

| **Core Instructional & Supplemental Materials** | |
|---|---|
| **Suggested Activities/Resources:**<br>● Articles in This Unit<br>○ "Molecules Cells Need"<br>○ Patient Stories: Problems with Body Systems article set<br>○ "Meet a Scientist Who Grows New Cells"<br>○ Systems of the Human Body article set<br>○ "Cellular Respiration"<br>○ "Growth & Repair"<br>○ "The Big Climb: A Story in Large and Small Scale"<br>○ "Blood Doping: Messing with Metabolism to Win Races"<br>○ Odd Organisms and How They Get the Molecules They Need article set | **Supplemental Materials**<br>● Digital Resources included in each unit<br>○ Metabolism Simulation<br>● Multi-language glossary<br>● Hands-On Flextension:<br>○ Investigating the Nervous System<br>● Marie Maynard Daly |

| Grade: 8 | Content Area: Science |
|---|---|

## Suggested Accommodations

**English Language Learners:**

- Multi-sensory instruction
- Flexible grouping
- Small group instruction
- Provide peer tutoring
- Use a strong student as a “buddy” (does not necessarily have to speak the primary language)
- Chunking information
- Scaffolded questioning
- Academic language support
- Vocabulary support
- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**

- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**

- Provide peer tutoring
- Use a strong student as a “buddy”

- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

**Economically Disadvantaged:**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| Unit 3: Metabolism Engineering Internship | Duration: 11 days |
|---|---|

| New Jersey Student Learning Standards | |
|---|---|
| **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. |

| **Grade: 8** | **Content Area: Science** |
|---|---|

| | |
|---|---|
| **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. |
| **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. |

| **Science and Engineering Practices** | **Discipline Core Ideas/Unit Enduring Understandings** | **Crosscutting Concepts** |
|---|---|---|
| **Practice 1: Asking Questions and Defining Problems**<br>● Students consider multiple criteria and constraints in defining their design problem. They also have opportunities to pose their own questions. In particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they read scientific texts, such as the Futura Food Engineer's Dossier.<br><br>**Practice 2: Developing and Using Models.**<br>● Students use the Futura RecipeTest Design Tool, a digital simulation, to test their designed solutions.<br><br>**Practice 3: Planning and Carrying Out Investigations.**<br>● Students work through the phases of the design cycle—Plan, Build, Test, Analyze—in developing optimal solutions to their design problem. They plan and carry out iterative tests in | **ETS1.A: Defining and Delimiting Engineering Problems:**<br>● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)<br><br>**ETS1.B: Developing Possible Solutions:**<br>● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)<br><br>● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)<br><br>● Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. | **Influence of Science, Engineering, and Technology on Society and the Natural World**<br>● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)<br><br>● The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)<br><br>**Energy and Matter**<br>● Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7) |

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| the Futura RecipeTest Design Tool and collect data that help inform their subsequent designs.<br><br>**Practice 4: Analyzing and Interpreting Data.**<br>● Students analyze the data recorded in the RecipeTracker to determine needed revisions to their designs.<br><br>**Practice 5: Using Mathematics and Computational Thinking.**<br>● Students calculate differences between the results of two tests as well as evaluate graphs and tables as they look for trends, with the ultimate goal of optimizing their designs. Students break down this problem into smaller parts by isolating design variables to understand their impacts on the final results.<br><br>**Practice 6: Constructing Explanations and Designing Solutions.**<br>● Students use an iterative process to optimize a design solution.<br><br>**Practice 7: Engaging in Argument from Evidence.**<br>● Students evaluate competing design solutions, based on agreed-upon design criteria, to choose the best recipe.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information.**<br>● Students read and research in the Futura Food Engineer's Dossier; analyze different design iterations, using their data tables; and write final proposals describing their optimal recipe designs. | (MS-ETS1-3)<br><br>● Models of all kinds are important for testing solutions. (MS-ETS1-4)<br><br>**ETS1.C: Optimizing the Design Solution:**<br>● Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)<br><br>● The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)<br><br>**LS1.C: Organization for Matter and Energy Flow in Organisms:**<br>● 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) | |

| Grade: 8 | Content Area: Science |
|---|---|

| New Jersey Social and Emotional Competencies and Sub-Competencies | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals.<br>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | ● Recognize and identify the thoughts, feelings, and perspectives of others.<br>● Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>● Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>● Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | ● Develop, implement, and model effective problem-solving and critical thinking skills.<br>● Identify the consequences associated with one's actions in order to make constructive choices.<br>● Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | ● Establish and maintain healthy relationships.<br>● Utilize positive communication and social skills to interact effectively with others.<br>● Identify ways to resist inappropriate social pressure.<br>● Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>● Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through |

| | |
|---|---|
| | particular details; provide a summary of the text distinct from personal opinions or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |

| | |
|---|---|
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP5** | Use appropriate tools strategically. |
| **MP6** | Attend to precision. |
| **8.F.5** | Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. |
| **8.EE.4** | Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. |

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| **Grade: 8** | **Content Area: Science** |
|---|---|

| **Career Readiness, Life Literacies & Key Skills** | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

| **Evidence of Student Learning** | |
|---|---|
| **Formative Tasks:**<br>● Teacher observations<br>● Class discussions<br>● Whiteboard/Communicators<br>● On-the-Fly Assessments<br>● Daily classwork<br>● Checks for understanding<br>● Clipboard Assessment Tool<br>● Critical Juncture Assessment<br>● Crosscutting Concept Tracker | **Alternative Assessments:**<br>● Oral assessments<br>● Teacher-Created Projects<br>● https://www.khanacademy.org/<br>● Completion of webquests<br>● On-Line Laboratory activities<br>● Online assessment activities example:<br>○ Kahoot<br>○ Quizizz |

**Lakewood Public School District Curriculum Guide**

| Grade: 8 | Content Area: Science |
|---|---|

| Summative Assessments: | Benchmark Assessments: |
|---|---|
| ● Unit Tests<br>● Midterm Exam<br>● Final Exam<br>● Chapter/Unit Test<br>● Writing Assignments<br>● Presentations<br>● Laboratory Reports/Practical<br>● Unit Projects | ● Quarterly Benchmarks<br>● Beginning/End of Year Assessment<br>● Midterm Assessment<br>● Unit Common Assessment |

| Knowledge & Skills | |
|---|---|
| **Enduring Understandings:**<br>● Design a health bar to meet the metabolic needs of populations affected by natural disasters.<br>● Define a new engineering problem related to food scarcity, food packaging, or meeting specific metabolic needs.<br>● Engineers use scientific knowledge about metabolism to design solutions that meet human needs.<br>● Metabolic needs for energy, growth, and repair depend on the types and amounts of nutrients consumed.<br>● Different foods provide carbohydrates and proteins that are broken down into molecules cells can use.<br>● Glycemic index influences how quickly energy becomes available to the body.<br>● Engineering problems are defined by criteria, and solutions must be evaluated against those criteria.<br>● Trade-offs are unavoidable in engineering design, and not all criteria can be met equally well.<br>● Iteration improves design quality through testing, feedback, and revision.<br>● Evidence and reasoning are essential for explaining why a design solution is effective.<br>● People have varied metabolic needs, so effective solutions must consider user differences.<br>● Clear, professional communication strengthens the impact and credibility of engineering solutions. | **Essential Questions:**<br>● How do engineers use knowledge of metabolism to solve real-world problems?<br>● How do carbohydrates and proteins support the body's energy, growth, and repair needs?<br>● How does glycemic index affect how the body uses food for energy?<br>● How can food be engineered to meet the metabolic needs of different people?<br>● Why do different users require different design solutions?<br>● How do criteria shape the design of an engineering solution?<br>● Why are trade-offs necessary when designing solutions?<br>● How does testing and iteration improve an engineering design?<br>● How can evidence be used to justify why one design solution is better than another?<br>● Why is professional scientific and engineering communication important when sharing solutions? |
| **Content**<br>*Students will know…* | **Skills**<br>*Students will be able to …* |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| ● Engineers design physical objects and processes that try to solve real-world problems.<br>● Criteria define the engineering problem.<br>● Background research is necessary when solving an engineering problem.<br>● Metabolic needs for survival are energy and cellular growth and repair.<br>● Food provides carbohydrates and proteins necessary to meet metabolic needs.<br>● Glycemic index measures how fast carbohydrates break down into glucose.<br>● Professionals need to be organized and have systems in place that help them deliver their work on time.<br>● Protein is broken down into amino acids in the body, which are used in the cells for growth and repair.<br>● Carbohydrates are broken down into glucose, which is used in the cells for energy.<br>● Different foods have different glycemic indices, which is the rate of carbohydrates breaking down.<br>● Specific ingredients meet various metabolic needs.<br>● People's needs vary, and one solution will not necessarily work for every user.<br>● People's metabolic needs determine the amount of proteins and carbohydrates they need to consume.<br>● Scientific communication is the process of sharing scientific arguments, explanations, ideas, or data with an audience.<br>● Engineers conduct their work in a methodical way.<br>● Engineers consider trade-offs by weighing the impact of each criterion against the others<br>● The results of each design test are evaluated based on how the design addresses the criteria.<br>● Modifications are made to a design based on evaluated results. Designs are modified in order to be tested again. This is called an iteration.<br>● Engineers take feedback into consideration during the iterative process (modifying the design at each iteration).<br>● For optimal designs, engineers complete several iterations, often combining the best parts of previous designs.<br>● Engineers consider trade-offs by weighing the impact of each criterion against the others. | ● Explain how engineers design physical objects and processes to solve real-world problems.<br>● Define an engineering problem by identifying criteria that describe a successful solution.<br>● Conduct background research to understand metabolic needs and inform design decisions.<br>● Explain that energy and cellular growth and repair are essential metabolic needs for survival.<br>● Identify carbohydrates and proteins as key nutrients that support metabolic needs.<br>● Explain how carbohydrates are broken down into glucose and used by cells for energy.<br>● Explain how proteins are broken down into amino acids and used by cells for growth and repair.<br>● Describe glycemic index as a measure of how quickly carbohydrates are converted into glucose.<br>● Compare foods based on glycemic index and explain how different rates of glucose release affect metabolic needs.<br>● Analyze how specific ingredients meet different metabolic needs.<br>● Explain why people have different metabolic needs and why a single solution may not work for all users.<br>● Design a food-based solution that meets defined metabolic criteria for a specific user.<br>● Apply organizational strategies to manage time, materials, and tasks during an engineering project.<br>● Follow a methodical engineering design process to develop and test solutions.<br>● Evaluate design results based on how well they meet the established criteria.<br>● Analyze trade-offs by weighing how well a design meets some criteria at the expense of others.<br>● Revise and modify a design based on test results and feedback.<br>● Explain iteration as a process of improving a design through repeated testing and modification.<br>● Compare multiple design iterations to identify improvements and optimal features.<br>● Use evidence to justify why a design solution is optimal, including discussion of trade-offs.<br>● Write a professional engineering proposal that explains how and why a design solution works.<br>● Use topic-specific scientific and engineering vocabulary appropriate for a professional audience.<br>● Use reasoning to clearly connect evidence to claims in written and oral explanations.<br>● Revise written proposals to improve clarity, use of evidence, and professionalism.<br>● Explain how solutions can differ based on criteria and user needs. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| ● Results are evaluated based on how they address the criteria.<br>● Trade-offs may make it difficult or impossible to meet all the criteria for a design project.<br>● Strong engineering proposals use evidence to describe why the design is optimal, including a discussion of trade-offs and comparisons to earlier iterations.<br>● An engineer's written proposal explains to others how and why a design solution works.<br>● Strong proposals are written for a professional audience and use topic-specific vocabulary words.<br>● Reasoning is a process that scientists use to connect evidence to their claims.<br>● Engineers improve the use of evidence in and the professionalism of their writing when they revise their written proposals.<br>● Solutions to a problem will differ based on the defined criteria.<br>● Food engineers design solutions related to food shortage, food packing, and meeting metabolic needs of consumers.<br>● Important steps in the design process include identifying a problem in need of a solution, and defining criteria for a successful solution.<br>● Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination and creativity. | ● Describe how food engineers address problems related to food supply, packaging, and metabolic needs.<br>● Communicate scientific and engineering ideas effectively to an audience using evidence and clear explanations.<br>● Demonstrate persistence, precision, logic, creativity, and imagination throughout the engineering design process. |

## Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

- Articles in This Unit
  - “Request for Proposals”
  - “Meeting Your Metabolic Needs”
  - “Ingredient Information”
  - “Target Populations”
  - “Proposal Resources”

**Supplemental Materials**

- Digital Resources included in each unit
  - Futura Workspace
- Multi-language glossary
- Hands-On Flextension:
  - Taste-Testing Ingredients
- Calling All Minds: How To Think and Create Like an Inventor by Temple Grandin

## Suggested Accommodations

**English Language Learners:**

- Multi-sensory instruction
- Flexible grouping
- Small group instruction
- Provide peer tutoring
- Use a strong student as a “buddy” (does not necessarily have to speak the primary language)

- Chunking information
- Scaffolded questioning
- Academic language support
- Vocabulary support
- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**

- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**

- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning

- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

**Economically Disadvantaged:**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| Unit 4: Traits and Reproduction | Duration: 19 days |
|---|---|

| New Jersey Student Learning Standards | |
|---|---|
| **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. |
| **MS-LS1-3** | Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. |
| **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. |
| **MS-LS1-5** | Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. |
| **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. |
| **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. |
| **MS-LS4-5** | Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. |

| Science and Engineering Practices | Discipline Core Ideas/Unit Enduring Understandings | Crosscutting Concepts |
|---|---|---|
| **Practice 1: Asking Questions.**<br>● As students investigate a puzzling case of variation in a spider family, their inquiry is guided by a series of strategic questions. They also have many opportunities to pose their own questions. In particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they read science articles.<br><br>**Practice 2: Developing and Using Models.**<br>● Students complete visual representations to demonstrate their understanding of key concepts throughout the unit. Physical models are used to compare the structures of protein molecules and how this influences their functions. Students also use physical models to represent the role of genes in the production of proteins and how mutations change the instructions and, therefore, the protein being produced. | **LS1.A Structure and Function:**<br>● 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)<br><br>**LS1.B Growth and Development of Organisms:**<br>● Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)<br><br>● Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)<br><br>● Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)<br><br>● Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) | **Cause and Effect**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4)<br><br>● Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)<br><br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-5)<br><br>**Connections to Engineering, Technology, and Applications of Science**<br>● Interdependence of Science, Engineering, and Technology Engineering advances have led to important discoveries in virtually every field of |

| | | |
|---|---|---|
| **Practice 4: Analyzing and Interpreting Data.**<br>● Students have several opportunities to analyze and interpret data, particularly in data tables, as they investigate the trait of silk flexibility in Darwin's bark spiders and the traits of running ability in a family.<br><br>**Practice 6: Constructing Explanations.**<br>● In each chapter, students deepen their understanding of trait variation to create increasingly robust explanations about the differences in silk flexibility in Darwin's bark spiders. Students first explain that trait variation is caused by differences in proteins. They then account for differences in proteins by explaining that organisms have different genes that instruct for proteins. The final component of students' explanations is that organisms can inherit multiple possible combinations of genes.<br><br>**Practice 7: Engaging in Argument from Evidence.**<br>● Students evaluate claims regarding the possible reasons why the trait for silk flexibility varies among the members of the Darwin's bark spider family. Students engage in scientific reasoning and produce written arguments. In the Science Seminar, students practice both oral and written argumentation to debate alternate claims about why members of a family have different traits for running ability. | **LS3.A Inheritance of Traits:**<br>● 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)<br><br>● 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)<br><br>**LS3.B Variation in Traits:**<br>● 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)<br><br>● 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) | science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)<br><br>**Structure and Function**<br>● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)<br><br>**Systems and System Models**<br>● Systems may interact with other systems; they may have subsystems and be a part of larger complex systems. (MS-LS1-3)<br><br>**Structure and Function**<br>● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)<br><br>**Connections to Nature of Science**<br><br>**Science is a Human Endeavor**<br>● Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. |

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| **Practice 8: Obtaining, Evaluating, and Communicating Information.**<br>● Students have multiple opportunities to engage in Active Reading, an approach to obtaining information from science texts. They also have frequent opportunities to communicate orally and in writing. | **LS4.B Natural Selection:**<br>● 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) | (MS-LS1-3)<br><br>**Science Addresses Questions About the Natural and Material World**<br>● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5) |

| New Jersey Social and Emotional Competencies and Sub-Competencies | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals.<br>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | ● Recognize and identify the thoughts, feelings, and perspectives of others.<br>● Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>● Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>● Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | ● Develop, implement, and model effective problem-solving and critical thinking skills.<br>● Identify the consequences associated with one's actions in order to make constructive choices.<br>● Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | ● Establish and maintain healthy relationships.<br>● Utilize positive communication and social skills to interact effectively with others.<br>● Identify ways to resist inappropriate social pressure.<br>● Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>● Identify who, when, where, or how to seek help for oneself or others when needed. |

| Grade: 8 | Content Area: Science |
|---|---|

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |
| **MP5** | Use appropriate tools strategically. |
| **MP7** | Look for and make use of structure. |
| **8.F.5** | Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. |
| **8.EE.4** | Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. |

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| Career Readiness, Life Literacies & Key Skills | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

| Evidence of Student Learning | |
|---|---|
| **Formative Tasks:**<br>• Teacher observations<br>• Class discussions<br>• Whiteboard/Communicators<br>• On-the-Fly Assessments<br>• Daily classwork<br>• Checks for understanding<br>• Clipboard Assessment Tool<br>• Critical Juncture Assessment | **Alternative Assessments:**<br>• Oral assessments<br>• Teacher-Created Projects<br>• https://www.khanacademy.org/<br>• Completion of webquests<br>• On-Line Laboratory activities<br>• Online assessment activities example: |

| | |
|---|---|
| ● Crosscutting Concept Tracker | ○ Kahoot<br>○ Quizizz |
| **Summative Assessments:**<br>● Unit Tests<br>● Midterm Exam<br>● Final Exam<br>● Chapter/Unit Test<br>● Writing Assignments<br>● Presentations<br>● Laboratory Reports/Practical<br>● Unit Projects | **Benchmark Assessments:**<br>● Quarterly Benchmarks<br>● Beginning/End of Year Assessment<br>● Midterm Assessment<br>● Unit Common Assessment |

| **Knowledge & Skills** | |
|---|---|
| **Enduring Understandings:**<br>● The function of a protein molecule depends on its structure and how it interacts with other protein molecules. (1.3)<br>● Differences in the structure of protein molecules affect how they connect to other protein molecules. This can result in different traits. (1.4)<br>● The structure of molecules determines how they function at a molecular scale, which determines the properties of the object they make up. (1.4)<br>● Organisms can have different proteins in their cells for a particular feature. (1.5)<br>● Genes are instructions for proteins. (2.2)<br>● Each gene version provides a unique instruction to make a specific protein molecule in an organism's cells. (2.2)<br>● An organism has two copies of a gene for each feature. (2.3)<br>● The two copies of a gene for each feature can be the same version (homozygous) and provide instructions for only one type of protein. (2.3)<br>● The two copies of a gene for each feature can be different versions (heterozygous) and provide instructions for two types of proteins. (2.3)<br>● Organisms inherit their genes through sexual reproduction. (3.2)<br>● Each parent randomly passes on one of its two copies of each gene to its offspring. Each offspring, therefore, receives two copies of each gene, one from each parent. (3.2) | **Essential Questions:**<br>● Why do traits for silk flexibility vary within this family of Darwin's bark spiders?<br>● What determines an organism's traits at the molecular scale?<br>● Why do Darwin's bark spiders make different proteins for silk flexibility?<br>● How can organisms make different protein molecules for a particular feature?<br>● Why do some organisms make one type of protein for a feature and other organisms make two?<br>● Why do Darwin's bark spider offspring have different gene combinations even though they have the same parents?<br>● How do organisms get their genes?<br>● How does sexual reproduction result in variation among offspring?<br>● Why is Jackie an elite distance runner when no one else in her family has that trait? |

| | |
|---|---|
| ● Through sexual reproduction, each offspring can inherit a different combination of gene versions. Therefore, siblings can have different traits from each other and even from their parents. (3.3)<br>● | |
| **Content**<br>*Students will know…*<br>● Traits vary between parents and offspring and among siblings.<br>● Differences among features (such as eye color) are called traits.<br>● People from different social, cultural, and ethnic backgrounds work as scientists and engineers.<br>● Spiders can make many different kinds of silk.<br>● The function of a protein molecule depends on its structure and how it interacts with other protein molecules.<br>● The flexibility of spider silk is determined by the structure of its protein molecules.<br>● Differences in the structure of protein molecules affect how they connect to other protein molecules. This can result in different traits.<br>● The structure of molecules determines how they function at a molecular scale, which determines the properties of the object they make up.<br>● Organisms can have different proteins in their cells for a particular feature.<br>● Even a behavioral trait such as one's running ability may be affected by variation in protein molecules.<br>● Runners who have more ACTN3 protein in their cells tend to be faster sprinters.<br>● Reading actively means thinking about one's own understanding as one reads.<br>● A person with hemophilia has genes that do not provide the right instructions for making the clotting factor proteins needed to form scabs.<br>● Genes are instructions for proteins.<br>● Each gene version provides a unique instruction to make a specific protein molecule in an organism's cells.<br>● Genes do not make proteins; instead, they send instructions to another part of the cell where the protein is made.<br>● Mutations are changes to a gene version, which can result in changes to proteins. | **Skills**<br>*Students will be able to …*<br>● Define traits as differences in features among organisms.<br>● Explain how traits can vary between parents and offspring and among siblings.<br>● Recognize that scientists and engineers come from diverse social, cultural, and ethnic backgrounds.<br>● Describe how different organisms can produce different proteins that affect traits.<br>● Explain how the structure of a protein affects its function.<br>● Use examples to explain how differences in protein structure can lead to different traits.<br>● Explain how molecular structure determines function at a molecular scale and influences observable properties.<br>● Describe how variation in protein molecules can affect physical and behavioral traits.<br>● Explain how ACTN3 protein affects muscle function and sprinting ability.<br>● Use active reading strategies to monitor understanding while reading science texts.<br>● Explain that genes provide instructions for making proteins.<br>● Describe how genetic instructions are used by the cell to produce proteins.<br>● Explain how mutations are changes in gene versions that can alter proteins and traits.<br>● Describe that organisms have two copies of each gene for a feature.<br>● Differentiate between homozygous and heterozygous gene combinations.<br>● Explain how different gene versions can lead to different proteins in cells.<br>● Predict possible gene versions based on information about proteins or traits.<br>● Explain how reproductive cells contain only one copy of each gene.<br>● Explain how genes are inherited through sexual reproduction.<br>● Describe how random inheritance results in variation among offspring.<br>● Explain why siblings can have different traits from each other and from their parents. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| ● An organism has two copies of a gene for each feature.<br>● The two copies of a gene for each feature can be the same version (homozygous) and provide instructions for only one type of protein.<br>● The two copies of a gene for each feature can be different versions (heterozygous) and provide instructions for two types of proteins.<br>● The ACTN3 protein is produced with instructions from a particular gene.<br>● It is possible to make predictions about an organism's genes based on information about its proteins.<br>● Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.<br>● Each reproductive cell only has one copy of each gene.<br>● Identical twins have identical genes.<br>● Organisms inherit their genes through sexual reproduction.<br>● Each parent randomly passes on one of its two copies of each gene to its offspring. Each offspring, therefore, receives two copies of each gene, one from each parent.<br>● Through sexual reproduction, each offspring can inherit a different combination of gene versions. Therefore, siblings can have different traits from each other and even from their parents.<br>● The offspring of Darwin's bark spiders inherited traits that vary because both parents had heterozygous gene combinations. As a result, multiple combinations of genes could be passed down to the spiders' offspring.<br>● Different gene combinations can result in different traits. Therefore, an offspring can have a trait that neither of its parents have.<br>● Selective breeding can be used to produce offspring with desired traits.<br>● Science depends on evaluating proposed explanations.<br>● Reasoning is a process that scientists use to connect evidence to their claims.<br>● Mutations that result in a change to a trait are rare.<br>● ACTN3 protein connects muscle fibers which helps them contract more rapidly. | ● Use models or examples to explain how offspring can inherit traits that neither parent shows.<br>● Explain how selective breeding can be used to produce desired traits.<br>● Evaluate scientific explanations by examining evidence and reasoning.<br>● Use reasoning to connect evidence to claims about inheritance and traits.<br>● Explain why some traits change due to rare mutations.<br>● Analyze situations in which evidence may support more than one claim.<br>● Engage in scientific discussions to refine understanding and evaluate ideas.<br>● Explain how scientists revise explanations when presented with convincing evidence.<br>● Construct a written scientific argument that includes a claim, evidence, and reasoning.<br>● Integrate multiple pieces of evidence to support a scientific claim about traits and reproduction. |

| | |
|---|---|
| ● Sometimes evidence can support more than one claim.<br>● Scientists and engineers are guided by habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.<br>● Discussing evidence and ideas with others helps build new understanding.<br>● Scientists can change their minds when presented with convincing evidence.<br>● To convince its reader, a written scientific argument needs to include a claim, describe specific evidence, and explain how the evidence supports the claim.<br>● Sometimes different pieces of evidence need to be considered together to best support a claim. | |

## Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

- Articles in This Unit
  - “Surprising Spider Silk”
  - “Hemophilia, Proteins, and Genes”
  - “Exploring the Human Genome”
  - “Why Are Identical Twins Rare?”
  - “Invasion of the Periodical Cicada”
  - “Why the Corpse Flower Smells So Bad”
  - “Sea Anemones: Two Ways to Reproduce”
  - “Cloning Mammoths: A Mammoth Task”
  - “Can Genes Affect Running Ability?”
  - “Growing Giant Pumpkins”

**Supplemental Materials**

- Digital Resources included in each unit
  - Traits and Reproduction Simulation
- Multi-language glossary
- Hands-On Flextension:
  - Plant Structures for Reproduction
- Races: Are we so different?
- Science misuse to genetics and reproduction

## Suggested Accommodations

**English Language Learners:**

- Multi-sensory instruction
- Flexible grouping
- Small group instruction
- Provide peer tutoring
- Use a strong student as a “buddy” (does not necessarily have to speak the primary language)
- Chunking information
- Scaffolded questioning
- Academic language support
- Vocabulary support

- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**
- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**
- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

| Grade: 8 | Content Area: Science |
|---|---|

**Economically Disadvantaged:**
- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**
- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| **Unit 5:** Natural Selection | **Duration: 23 days** |
|---|---|

| New Jersey Student Learning Standards | |
|---|---|
| **MS-LS2-4** | Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. |
| **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. |
| **MS-LS4-4** | Construct an explanation based on evidence that describes how genetic variations of traits in a population increases some individuals' probability of surviving and reproducing in a specific environment. |
| **MS-LS4-5** | Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. |
| **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. |

| Science and Engineering Practices | Discipline Core Ideas/Unit Enduring Understandings | Crosscutting Concepts |
|---|---|---|

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| **Practice 1: Asking Questions**<br>● As students investigate what caused the newts to be so poisonous, their inquiry is guided by a series of strategic questions. Students also have many opportunities to pose their own questions. In particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they read science articles.<br><br>**Practice 2: Developing and Using Models:**<br>● Students spend extensive time investigating a simulation that models the process of natural selection. Students also use a visual representation, the Natural Selection Modeling Tool, to create models that show their ideas about how and why the distribution of traits in a population changes over time.<br><br>**Practice 3: Planning and Carrying Out Investigations:**<br>● Students conduct investigations using the digital simulation to develop an understanding of the process of natural selection.<br><br>**Practice 4: Analyzing and Interpreting Data.**<br>● Throughout the unit, students are asked to analyze histograms showing the distribution of traits in a population over time. Using these, as well as other data and their understanding of natural selection, students make inferences about why distributions of traits did or did not change over time.<br><br>**Practice 5: Using Mathematics and** | **LS3.A: Inheritance of Traits:**<br>● 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)<br><br>**LS3.B: Variation of Traits:**<br>● 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)<br><br>**LS4.B: Natural Selection:**<br>● Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)<br><br>**LS4.C: Adaptation:**<br>● 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, | **Stability and Change**<br>● Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)<br><br>**Structure and Function**<br>● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)<br><br>**Cause and Effect**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4), (MS-LS4-5), (MS-LS4-6)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge is Based on Empirical Evidence**<br>● Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)<br><br>**Connections to Engineering, Technology, and Applications of Science**<br><br>**Interdependence of Science, Engineering, and Technology**<br>● Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have |

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| **Computational Thinking:**<br>● Throughout the unit, students create histograms to communicate how they think the distribution of traits in a given population will change under given circumstances. Students apply the unit content to make a prediction and then create a series of histograms at different time points to explain their thinking.<br><br>**Practice 6: Constructing Explanations:**<br>● Students learn about scientific explanations and have multiple opportunities to make increasingly complex explanations (and defend them through argumentation) over the course of the unit as they explain how the process of natural selection can lead to changes in the distribution of traits in a population over time.<br><br>**Practice 7: Engaging in Argument from Evidence**<br>● Students receive instruction about the structure of a scientific argument and are supported in engaging in scientific reasoning and producing both oral and written arguments.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information**<br>● Students have multiple opportunities to engage in Active Reading, an approach to obtaining information from science texts. Students evaluate evidence to determine its quality and its relevance to a particular claim. Students communicate information in writing and in structured discussions | the distribution of traits in a population changes. (MS-LS4-6)<br><br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience:**<br>● 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)<br><br>**LS4.B: Natural Selection:**<br>● 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 onto offspring. (MS-LS4-5) | led to the development of entire industries and engineered systems. (MS-LS4-5)<br><br>**Science Addresses Questions About the Natural and Material World**<br>● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5) |

| Grade: 8 | Content Area: Science |
|---|---|

| New Jersey Social and Emotional Competencies and Sub-Competencies | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals.<br>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | ● Recognize and identify the thoughts, feelings, and perspectives of others.<br>● Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>● Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>● Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | ● Develop, implement, and model effective problem-solving and critical thinking skills.<br>● Identify the consequences associated with one's actions in order to make constructive choices.<br>● Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | ● Establish and maintain healthy relationships.<br>● Utilize positive communication and social skills to interact effectively with others.<br>● Identify ways to resist inappropriate social pressure.<br>● Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>● Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions |

| | |
|---|---|
| | or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |
| **MP5** | Use appropriate tools strategically. |
| **MP6** | Attend to precision. |
| **8.SP.1** | Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. |
| **8.SP.2** | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. |
| **8.SP.4** | Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. |

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| Career Readiness, Life Literacies & Key Skills | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

| Evidence of Student Learning | |
|---|---|
| **Formative Tasks:**<br>● Teacher observations<br>● Class discussions<br>● Whiteboard/Communicators<br>● On-the-Fly Assessments<br>● Daily classwork<br>● Checks for understanding<br>● Clipboard Assessment Tool<br>● Critical Juncture Assessment<br>● Crosscutting Concept Tracker | **Alternative Assessments:**<br>● Oral assessments<br>● Teacher-Created Projects<br>● https://www.khanacademy.org/<br>● Completion of webquests<br>● On-Line Laboratory activities<br>● Online assessment activities example:<br>○ Kahoot<br>○ Quizizz |

| Grade: 8 | Content Area: Science |
|---|---|

| Summative Assessments: | Benchmark Assessments: |
|---|---|
| ● Unit Tests<br>● Midterm Exam<br>● Final Exam<br>● Chapter/Unit Test<br>● Writing Assignments<br>● Presentations<br>● Laboratory Reports/Practical<br>● Unit Projects | ● Quarterly Benchmarks<br>● Beginning/End of Year Assessment<br>● Midterm Assessment<br>● Unit Common Assessment |

## Knowledge & Skills

**Enduring Understandings:**

- A population can be described by the traits present and by the number of individuals who have each trait. (1.3)
- The number of individuals with each trait in a population can change over time. (1.4)
- Over many generations, individuals with adaptive traits become more common in a population, while individuals with non-adaptive traits become less common. (1.4)
- The traits that exist in a population determine which traits can become more common over many generations. (1.4)
- Whether or not a trait is adaptive depends on the environment. (1.5)
- Biologists analyze data about environmental conditions (the causes) to explain changes in the distribution of traits in populations (the effects). (1.6)
- Genes are instructions for making protein molecules and protein molecules determine an organism's traits. (2.2)
- Individuals inherit their genes from their parents. Genes, and therefore traits, in a population are passed down from generation to generation. (2.2)
- Individuals with adaptive traits are more likely to live longer and have offspring; individuals with non-adaptive traits are more likely to die without having offspring. (2.4)
- Mutations are changes to genes that can lead to changes to protein molecules, which can result in changes to traits. (3.2)
- Mutations to genes can sometimes introduce new traits into a population. (3.2)
- A new trait will only become more common in a population if it is adaptive. (3.3)

**Essential Questions:**

- Why do populations change over time?
- How can we describe a population?
- What makes the distribution of traits in a population change?
- How did the trait for increased poison level become more common in the newt population?
- How do individuals in a population get their traits?
- How do some traits become more common over many generations while others become less common?
- How did a poison-level trait that wasn’t always present in the newt population become the most common trait?
- How do new traits appear in populations?
- What determines whether a new trait will become more common in the population?
- What caused the stickleback population to have less armor and become faster?

| Grade: 8 | Content Area: Science |
|---|---|

**Content**

*Students will know…*

- Individuals within a population can have different traits.
- A population is a group of the same type of organism living in the same area.
- People from different social, cultural, and ethnic backgrounds work as scientists and engineers.
- A population can be described by the traits present and by the number of individuals who have each trait.
- Histograms are useful when showing the variation and distribution of traits in a population.
- The number of individuals with each trait in a population can change over time.
- Over many generations, individuals with adaptive traits become more common in a population, while individuals with non-adaptive traits become less common.
- The traits that exist in a population determine which traits can become more common over many generations.
- Populations can die out if they do not have individuals with adaptive traits.
- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.
- Whether or not a trait is adaptive depends on the environment.
- Biologists analyze data about environmental conditions (the causes) to explain changes in the distribution of traits in populations (the effects).
- Genes, and therefore traits, are passed on from parent to offspring.
- Reproduction does not always create new individuals with adaptive traits.
- Genes are instructions for making protein molecules and protein molecules determine an organism's traits.
- Individuals inherit their genes from their parents. Genes, and therefore traits, in a population are passed down from generation to generation.
- If an individual has an adaptive trait, that individual is more likely to live longer and have more opportunities to reproduce.

**Skills**

*Students will be able to …*

- Define a population as a group of the same type of organism living in the same area.
- Explain that individuals within a population can have different traits.
- Describe a population using the traits present and the number of individuals with each trait.
- Use histograms to represent and analyze the variation and distribution of traits in a population.
- Explain how the number of individuals with specific traits in a population can change over time.
- Explain how adaptive traits become more common in a population over many generations.
- Explain why non-adaptive traits tend to become less common over many generations.
- Analyze how the traits already present in a population limit which traits can increase in frequency.
- Explain why populations can die out if they lack individuals with adaptive traits.
- Explain that whether a trait is adaptive depends on environmental conditions.
- Analyze data about environmental conditions to explain changes in trait distribution within populations.
- Explain that genes are passed from parents to offspring and determine traits.
- Explain how genes provide instructions for making protein molecules that affect traits.
- Explain why reproduction does not always result in offspring with adaptive traits.
- Explain how individuals with adaptive traits are more likely to survive and reproduce.
- Explain how individuals with non-adaptive traits are less likely to survive long enough to reproduce.
- Use examples to explain how a trait such as poison can be adaptive in certain environments.
- Explain how differences in survival and reproduction lead to changes in populations over generations.
- Define mutation as a random change in a gene.
- Explain how mutations can change proteins and result in new traits.
- Analyze why some mutations are adaptive, some are non-adaptive, and some have no effect.
- Explain why a new trait will only become more common in a population if it is adaptive.
- Use cause-and-effect reasoning to explain how environmental pressures influence populations.
- Evaluate multiple pieces of evidence when explaining changes in trait distributions.
- Use reasoning to explain how evidence supports claims about natural selection.

| | |
|---|---|
| ● If an individual does not have an adaptive trait, that individual is less likely to survive long enough to reproduce.<br>● Poison can serve as an adaptive trait if predators detect the poison before killing their prey.<br>● Organisms with adaptive traits are less likely to die than organisms with non-adaptive traits, which means they have more opportunities to reproduce.<br>● Individuals with adaptive traits are more likely to live longer and have offspring; individuals with non-adaptive traits are more likely to die without having offspring.<br>● Reasoning is the process that scientists use to explain how a piece of evidence supports a particular claim.<br>● A mutation is a random change to a gene that sometimes results in a new trait.<br>● Traits that result from mutations can be adaptive or non-adaptive, depending on the environment.<br>● Mutations are changes to genes that can lead to changes to protein molecules which can result in changes to traits.<br>● Mutations to genes can sometimes introduce new traits into a population.<br>● A new trait will only become more common in a population if it is adaptive.<br>● Scientists must carefully consider all available evidence before making arguments about a phenomenon.<br>● Discussing evidence and ideas with others helps build new understanding.<br>● Scientists can change their minds when presented with convincing evidence.<br>● To convince its reader, a written scientific argument needs to include a claim, describe specific evidence, and explain how the evidence supports the claim.<br>● Sometimes different pieces of evidence need to be considered together to best support a claim. | ● Construct a written scientific argument that includes a clear claim, specific evidence, and logical reasoning.<br>● Participate in scientific discussions to refine explanations and evaluate ideas.<br>● Explain why scientists may revise their explanations when presented with new or stronger evidence.<br>● Recognize that scientists and engineers come from diverse social, cultural, and ethnic backgrounds. |

| **Core Instructional & Supplemental Materials** | |
|---|---|
| **Suggested Activities/Resources:**<br>● Articles in This Unit<br>○ “The Rough-Skinned Newt” | **Supplemental Materials**<br>● Digital Resources included in each unit<br>○ Natural Selection Simulation |

| | |
|---|---|
| ○ "Meet a Scientist Who Studies Natural Selection" by Dave Yuan<br>○ Wildlife in the Woods article set<br>○ "Glowing Jellies"<br>○ "The Deadly Dare: Rough-Skinned Newt Defenses"<br>○ "Wallace and Darwin"<br>○ "Otters and the Bottleneck Effect"<br>○ Mutations: Not Just for Superheroes article set<br>○ "How to Make a Venomous Cabbage"<br>○ "The Stickleback Fish in Its Environment" | ● Multi-language glossary<br>● Hands-On Flextension:<br>○ Sunflower Seed Traits<br>○ Claw Traits over Generations |

## Suggested Accommodations

**English Language Learners:**

- Multi-sensory instruction
- Flexible grouping
- Small group instruction
- Provide peer tutoring
- Use a strong student as a "buddy" (does not necessarily have to speak the primary language)
- Chunking information
- Scaffolded questioning
- Academic language support
- Vocabulary support
- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**
- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**
- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

**Economically Disadvantaged:**
- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**
- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| **Grade: 8** | **Content Area: Science** |
|---|---|

| **Unit 6:** Natural Selection Engineering | **Duration: 11 days** |
|---|---|

| **New Jersey Student Learning Standards** | |
|---|---|
| **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. |
| **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. |
| **MS-LS4-4:** | Construct an explanation based on evidence that describes how genetic variations of traits in a population increases some individuals' probability of surviving and reproducing in a specific environment. |
| **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. |

| **Science and Engineering Practices** | **Discipline Core Ideas/Unit Enduring Understandings** | **Crosscutting Concepts** |
|---|---|---|
| **Practice 1: Asking Questions**<br>● Students consider multiple criteria in defining their design problem. They also have opportunities to pose their own questions. In particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they | **ETS1.A: Defining and Delimiting Engineering Problems:**<br>● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are | **Cause and Effect**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4), (MS-LS4-6)<br><br>**Structure and Function** |

read scientific texts, such as the Futura Biomedical Engineer's Dossier

**Practice 2: Developing and Using Models:**

- Students use the Futura MalariaMed Design Tool, a digital simulation, to build and test their designed solutions.

**Practice 3: Planning and Carrying Out Investigations:**

- Students work through the phases of the design cycle—Plan, Build, Test, Analyze—as they develop optimal solutions to their design problem. They plan and carry out iterative tests in the Futura MalariaMed Design Tool and collect data that help inform their subsequent designs.

**Practice 4: Analyzing and Interpreting Data.**

- Students analyze the data on their data sheets to determine needed revisions to their designs.

**Practice 5: Using Mathematics and Computational Thinking:**

- Students utilize histograms, generated as a result of their iterative tests in the Futura MalariaMed Design Tool, in order to analyze the effectiveness of their treatment designs.

**Practice 6: Constructing Explanations:**

- Students use an iterative process to optimize a design solution.

**Practice 7: Engaging in Argument from Evidence**

- Students evaluate competing design solutions, based on agreed-upon design criteria, likely to limit possible solutions. (MS-ETS1-1)

**ETS1.B: Developing Possible Solutions:**

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

**ETS1.C: Optimizing the Design Solution:**

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)

**Influence of Science, Engineering, and Technology on Society and the Natural World**

- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)
- The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions (MS-ETS1-1)

| | | |
|---|---|---|
| to choose the best design for malaria treatment.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information**<br>● Students read and research in the Futura Biomedical Engineer's Dossier; analyze different design iterations, using their data tables; and write final proposals describing their optimal designs for malaria treatment. | **LS3.B: Variation of Traits:**<br>● 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)<br><br>**LS4.B: Natural Selection:**<br>● Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)<br><br>**LS4.C: Adaptation:**<br>● 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) | |

| New Jersey Social and Emotional Competencies and Sub-Competencies | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals. |

| | |
|---|---|
| | • Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | • Recognize and identify the thoughts, feelings, and perspectives of others.<br>• Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>• Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>• Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | • Develop, implement, and model effective problem-solving and critical thinking skills.<br>• Identify the consequences associated with one's actions in order to make constructive choices.<br>• Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | • Establish and maintain healthy relationships.<br>• Utilize positive communication and social skills to interact effectively with others.<br>• Identify ways to resist inappropriate social pressure.<br>• Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>• Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |

| | |
|---|---|
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |
| **MP5** | Use appropriate tools strategically. |
| **MP6** | Attend to precision. |
| **MP8** | Look for and express regularity in repeated reasoning. |
| **8.EE.1:** | Know and apply the properties of integer exponents to generate equivalent numerical expressions. |
| **8.EE.4** | Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. |
| **8.F.5** | Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. |

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| Career Readiness, Life Literacies & Key Skills | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |

| **Grade: 8** | **Content Area: Science** |
|---|---|

| | |
|---|---|
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

| **Evidence of Student Learning** | |
|---|---|
| **Formative Tasks:**<br>● Teacher observations<br>● Class discussions<br>● Whiteboard/Communicators<br>● On-the-Fly Assessments<br>● Daily classwork<br>● Checks for understanding<br>● Clipboard Assessment Tool<br>● Critical Juncture Assessment<br>● Crosscutting Concept Tracker | **Alternative Assessments:**<br>● Oral assessments<br>● Teacher-Created Projects<br>● https://www.khanacademy.org/<br>● Completion of webquests<br>● On-Line Laboratory activities<br>● Online assessment activities example:<br>○ Kahoot<br>○ Quizizz |
| **Summative Assessments:**<br>● Unit Tests<br>● Midterm Exam<br>● Final Exam<br>● Chapter/Unit Test<br>● Writing Assignments<br>● Presentations<br>● Laboratory Reports/Practical<br>● Unit Projects | **Benchmark Assessments:**<br>● Quarterly Benchmarks<br>● Beginning/End of Year Assessment<br>● Midterm Assessment<br>● Unit Common Assessment |

| **Grade: 8** | **Content Area: Science** |
|---|---|

| **Knowledge & Skills** | |
|---|---|
| **Enduring Understandings:**<br>● Engineers apply scientific knowledge about natural selection to design solutions that address real-world health problems.<br>● Natural selection can occur in microscopic populations, such as disease-causing organisms, as well as in visible organisms.<br>● Selection pressures, such as drug treatments, can change the distribution of traits in a population over time.<br>● Mutations can introduce new traits, including drug resistance, into a population.<br>● Engineering solutions can influence how quickly or slowly resistance develops in a population.<br>● Combination solutions can be more effective than single solutions in limiting the spread of resistant traits.<br>● Engineering designs must balance multiple criteria, including effectiveness, side effects, and feasibility.<br>● Trade-offs are unavoidable in engineering design and influence which solutions are most effective.<br>● Models are useful for testing ideas about complex systems but have limitations.<br>● Strong engineering solutions are supported by evidence, reasoning, and iterative improvement. | **Essential Questions:**<br>● How can engineers use knowledge of natural selection to design effective solutions to human health problems?<br>● How does natural selection operate in microscopic populations such as disease-causing parasites?<br>● How do drug treatments act as selection pressures on populations?<br>● Why can single-solution designs lead to increased resistance over time?<br>● How do mutations contribute to the development of resistance in a population?<br>● Why are combination treatments often more effective than single treatments?<br>● How do criteria and constraints shape engineering solutions in medicine?<br>● Why must engineers consider trade-offs when designing treatments?<br>● How do models help engineers predict outcomes, and what are their limitations?<br>● How can evidence from testing and data be used to justify one engineering solution over another? |
| **Content**<br>*Students will know…*<br>● Engineers design plans, physical objects, and processes that try to solve human problems.<br>● Criteria define the engineering problem.<br>● Malaria is caused by microscopic parasites called Plasmodium, which are carried by certain mosquitoes from person to person.<br>● As a result of natural selection, some populations of malaria parasites are becoming resistant to certain antimalarial drugs.<br>● Scientific knowledge is constrained by human capacity, technology, and materials.<br>● Engineers need to understand the problem they are trying to solve so they can design an effective solution. | **Skills**<br>*Students will be able to …*<br>● Explain how engineers design plans, objects, and processes to solve human problems.<br>● Define an engineering problem by identifying criteria for a successful solution.<br>● Explain that malaria is caused by microscopic parasites and transmitted by mosquitoes.<br>● Explain that natural selection occurs in both visible populations and microscopic populations.<br>● Describe how antimalarial drugs act as a selection pressure on malaria parasite populations.<br>● Explain how mutations can lead to drug resistance in a parasite population.<br>● Analyze how individuals with drug-resistant traits are more likely to survive and reproduce in the presence of a drug. |

| | |
|---|---|
| ● Engineers read with purpose so they can understand relevant background information that impacts their work.<br>● Natural selection occurs in populations we can see, and also in populations that are too small to see without a microscope.<br>● Antimalarial drugs act as a selection pressure on a population of malaria parasites.<br>● When a mutation occurs that leads to a trait for drug resistance, those individuals with these traits will be more likely to survive the exposure to that drug and be able to reproduce and pass this trait to their offspring. This shifts the distribution of traits in that population, so that many more individual parasites have resistance for that drug.<br>● Engineers sometimes use models to test their designs.<br>● Models have limitations because they are often simplified.<br>● Using a single-drug treatment results in the distribution of traits in a malaria population shifting towards having more resistance to the drug used in that treatment.<br>● Once there is resistance to a drug, that drug may no longer effectively treat malaria.<br>● A key strategy for experimental design is isolating variables, where you select and test for the effect of one variable at a time.<br>● Many drugs have patient side effects, which can interfere with an effective drug treatment.<br>● Different antimalarial drugs have different characteristics.<br>● Modifications are made to designs based on evaluated results. Designs are modified in order to be tested again. This is called an iteration.<br>● Engineers consider trade-offs by weighing the impact of each criterion against the others.<br>● Combinations of drugs are most effective at minimizing the traits for resistance.<br>● People from different social, cultural, and ethnic backgrounds work as scientists and engineers.<br>● Advances in technology influence the progress of science and science has influenced advances in technology.<br>● Science knowledge can describe consequences of actions but is not responsible for society's decisions.<br>● Results are evaluated based on how they address the criteria. | ● Explain how drug resistance changes the distribution of traits in a population over time.<br>● Explain why a drug may become ineffective once resistance becomes common in a population.<br>● Compare single-drug treatments and combination-drug treatments in terms of their effects on resistance.<br>● Explain why combination drug therapies reduce the likelihood of resistance developing.<br>● Identify characteristics of different antimalarial drugs that affect treatment design.<br>● Analyze how side effects can interfere with the effectiveness of a drug treatment.<br>● Use background research to understand biological, technological, and human factors that affect engineering solutions.<br>● Explain how scientific knowledge is constrained by available technology, materials, and human capacity.<br>● Use models to test ideas about how drug treatments affect parasite populations.<br>● Explain the limitations of models and how simplifications can affect results.<br>● Design controlled tests by isolating and testing one variable at a time.<br>● Evaluate results based on how well a design meets the established criteria.<br>● Revise and iterate designs based on evidence from testing and feedback.<br>● Explain iteration as a process of improving a design through repeated testing and modification.<br>● Analyze trade-offs by weighing how well a solution meets some criteria over others.<br>● Explain why trade-offs may make it difficult to meet all criteria in a design project.<br>● Compare multiple design iterations to determine which solution best addresses resistance.<br>● Explain how advances in technology influence scientific understanding and vice versa.<br>● Distinguish between what science can explain and the societal decisions made using that knowledge.<br>● Use reasoning to connect evidence from models or data to claims about effective treatments.<br>● Construct an evidence-based engineering explanation that justifies a proposed solution.<br>● Collaborate and discuss ideas to refine understanding and improve design solutions.<br>● Recognize that scientists and engineers come from diverse social, cultural, and ethnic backgrounds. |

| | |
|---|---|
| ● Engineers take feedback into consideration during the iterative process (modifying the design at each iteration).<br>● For optimal designs, engineers complete several iterations, often combining the best parts of previous designs.<br>● Trade-offs may make it difficult or impossible to meet all the criteria for a design project.<br>● Strong engineering proposals use evidence to describe why the design is optimal, including a discussion of trade-offs and comparisons to earlier iterations.<br>● An engineer's written proposal explains to others how and why a design solution works.<br>● Strong proposals are written for a professional audience and use topic-specific vocabulary words.<br>● Engineers improve the use of evidence and the professionalism of their writing when they revise their written proposals.<br>● Solutions to a problem will differ based on the defined criteria.<br>● Biomedical engineers develop devices and medicines to help address health issues. | |

| **Core Instructional & Supplemental Materials** | |
|---|---|
| **Suggested Activities/Resources:**<br>● Articles in This Unit<br>○ “Request for Proposals”<br>○ “Basic Facts About Malaria”<br>○ “Antimalarial Drugs as Selection Pressure”<br>○ “Antimalarial Drug Resistance”<br>○ “Antimalarial Drugs”<br>○ “Meet an Engineer Who Prints in 3-D with Living Material”<br>○ “Proposal Resources” | **Supplemental Materials**<br>● Digital Resources included in each unit<br>○ Futura Workspace<br>● Multi-language glossary |

| **Suggested Accommodations** |
|---|
| **English Language Learners:**<br>● Multi-sensory instruction<br>● Flexible grouping<br>● Small group instruction<br>● Provide peer tutoring<br>● Use a strong student as a “buddy” (does not necessarily have to speak the primary language)<br>● Chunking information<br>● Scaffolded questioning |

- Academic language support
- Vocabulary support
- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**
- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**
- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models

- Modified assignments
- Brain breaks

**Economically Disadvantaged:**
- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**
- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| **Unit 7:** Evolution History | **Duration: 20 days** |
|---|---|

| **New Jersey Student Learning Standards** | |
|---|---|
| **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. |
| **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. |
| **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. |
| **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. |

| Grade: 8 | Content Area: Science |
|---|---|

| Science and Engineering Practices | Discipline Core Ideas/Unit Enduring Understandings | Crosscutting Concepts |
|---|---|---|
| **Practice 1: Asking Questions**<br>● As students investigate the Mystery Fossil, their inquiry is guided by a series of strategic questions. Students also have many opportunities to pose their own questions. In particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they read science articles.<br><br>**Practice 2: Developing and Using Models:**<br>● Students spend ample time exploring and investigating a digital simulation that represents a model of evolutionary relationships between living and extinct species. Students also use a digital modeling tool to create models that show their ideas about evolution.<br><br>**Practice 3: Planning and Carrying Out Investigations:**<br>● Students conduct investigations using a digital simulation to develop an understanding of how the process of natural selection can lead to speciation.<br><br>**Practice 4: Analyzing and Interpreting Data.**<br>● Students have opportunities in each chapter to study images of skeletons, practice making careful observations, and then analyze their observations. Analyzing and interpreting this data supports students in drawing conclusions about similarities and differences between | **LS4.A: Evidence of Common Ancestry and Diversity:**<br>● 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)<br><br>● 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)<br><br>● Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)<br><br>**LS4.C: Adaptation:**<br>● 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, | **Patterns**<br>● Patterns can be used to identify cause and effect relationships. (MS-LS4-2)<br><br>● Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1), (MS-LS4-3)<br><br>**Cause and Effect**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-6)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge is Based on Empirical Evidence**<br>● Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)<br><br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1), (MS-LS4-2) |

| | | |
|---|---|---|
| different species.<br><br>**Practice 6: Constructing Explanations:**<br>● Students learn about scientific explanations and have multiple opportunities to construct increasingly complex explanations (and defend them through argumentation) over the course of the unit as they explain where the Mystery Fossil belongs.<br><br>**Practice 7: Engaging in Argument from Evidence**<br>● Students receive instruction about the structure of a scientific argument and are supported in evaluating evidence, engaging in scientific reasoning, and producing both oral and written arguments.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information**<br>● Students have multiple opportunities to engage in Active Reading, an approach to obtaining information from science texts. They also have frequent opportunities to communicate orally and in writing. | the distribution of traits in a population changes. (MS-LS4-6) | |

| New Jersey Social and Emotional Competencies and Sub-Competencies | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals. |

| | |
|---|---|
| | • Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | • Recognize and identify the thoughts, feelings, and perspectives of others.<br>• Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>• Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>• Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | • Develop, implement, and model effective problem-solving and critical thinking skills.<br>• Identify the consequences associated with one's actions in order to make constructive choices.<br>• Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | • Establish and maintain healthy relationships.<br>• Utilize positive communication and social skills to interact effectively with others.<br>• Identify ways to resist inappropriate social pressure.<br>• Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>• Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **WHST.6-8.1** | Write arguments focused on discipline-specific content. |
| **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. |
| **RST.6-8.3** | Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| **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. |
| **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). |
| **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. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| **RST.6-8.10** | By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently. |
| **WHST.6-8.1** | Write arguments focused on discipline-specific content. |
| **WHST.6-8.1b** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources |
| **WHST.6-8.2d** | Use precise language and domain-specific vocabulary to inform about or explain the topic. |
| **WHST.6-8.9** | Draw evidence from informational texts to support analysis, reflection, and research. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |
| **MP5** | Use appropriate tools strategically. |
| **8.EE.4** | Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. |

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| Grade: 8 | Content Area: Science |
|---|---|

| Career Readiness, Life Literacies & Key Skills | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

| Evidence of Student Learning | |
|---|---|
| **Formative Tasks:**<br>● Teacher observations<br>● Class discussions<br>● Whiteboard/Communicators<br>● On-the-Fly Assessments<br>● Daily classwork<br>● Checks for understanding<br>● Clipboard Assessment Tool<br>● Critical Juncture Assessment<br>● Crosscutting Concept Tracker | **Alternative Assessments:**<br>● Oral assessments<br>● Teacher-Created Projects<br>● https://www.khanacademy.org/<br>● Completion of webquests<br>● On-Line Laboratory activities<br>● Online assessment activities example:<br>○ Kahoot<br>○ Quizizz |
| **Summative Assessments:**<br>● Unit Tests<br>● Midterm Exam<br>● Final Exam<br>● Chapter/Unit Test<br>● Writing Assignments | **Benchmark Assessments:**<br>● Quarterly Benchmarks<br>● Beginning/End of Year Assessment<br>● Midterm Assessment<br>● Unit Common Assessment |

| | |
|---|---|
| ● Presentations<br>● Laboratory Reports/Practical<br>● Unit Projects | |

| **Knowledge & Skills** | |
|---|---|
| **Enduring Understandings:**<br>● Species inherit their body structures from their ancestor populations. (1.4)<br>● Body structures that are shared between two species are evidence that these two species inherited the shared structures from a common ancestor population. (1.4)<br>● In populations separated into different environments, natural selection causes different changes to happen to each population. This causes descendant species to end up with differences in their shared structures. (2.3)<br>● When the environment is mostly the same over time, body structures stay stable. When the environment changes over time, body structures may change due to natural selection. (2.3)<br>● Over many generations and very long periods of time, many small changes can build up to large differences in body structures. (2.4)<br>● Among any three species, the two species that separated most recently are the most closely related to each other. (3.1)<br>● When two species share a structure that is not shared with a third species, this can be evidence that the first two species are more closely related to each other than to the third species. (3.2) | **Essential Questions:**<br>● Where in the museum does this new fossil belong?<br>● Why do different species share similar structures?<br>● How did wolves, whales, and the Mystery Fossil become so different from their common ancestor population?<br>● How does an ancestor population evolve into descendant species with differences in their shared structures?<br>● How did descendant species from a common ancestor become very different from one another?<br>● How can we tell if the Mystery Fossil is more closely related to wolves or to whales?<br>● When you compare different species, how can you tell which species are more closely related than others?<br>● Is the Tometti fossil more closely related to ostriches or to crocodiles? |
| **Content**<br>*Students will know…*<br>● Paleontologists look for similarities in body structures to decide whether species belong together.<br>● More careful and precise observations provide stronger evidence.<br>● Science disciplines share common rules of obtaining and evaluating empirical evidence.<br>● Two species “share” a body structure when that body structure features the same kinds of | **Skills**<br>*Students will be able to …*<br>● Explain how paleontologists use similarities in body structures to determine how species are related.<br>● Identify shared body structures as structures made of the same kinds of bones in the same relative positions.<br>● Explain that shared body structures are inherited from a common ancestor population.<br>● Use evidence from body structures to support claims about common ancestry. |

| | |
|---|---|
| bones, found in the same positions relative to each other and to the rest of the body.<br>● Body structures are inherited from an ancestor population.<br>● Frequently summarizing text is a good strategy for ensuring a better understanding of the text.<br>● Species inherit their body structures from their ancestor populations.<br>● Body structures that are shared between two species are evidence that these two species inherited the shared structures from a common ancestor population.<br>● Rereading an article can help to better understand important ideas from the text.<br>● New evidence can help us to better choose between different claims.<br>● Visual models can help us understand a concept, such as how shared body structures can indicate common ancestry.<br>● Species that have shared body structures can also have differences in those structures.<br>● Differences in body structures can be related to differences in these species' environments.<br>● One population can become two distinct populations after geographic separation and many generations.<br>● The process of speciation can occur with any type of organism.<br>● In populations separated into different environments, natural selection causes different changes to happen to each population. This causes descendant species to end up with differences in their shared structures.<br>● When the environment is mostly the same over time, body structures stay stable. When the environment changes over time, body structures may change due to natural selection.<br>● Over many generations and very long periods of time, many small changes can build up to large differences in body structures.<br>● The length of time that the human species has been on Earth is extremely short, relative to Earth's entire history.<br>● Species can become very different from a common ancestor population if they have been separated into different environments where different traits are adaptive.<br>● Among any three species, the two species that separated most recently are the most closely related to each other. | ● Explain why more careful and precise observations provide stronger scientific evidence.<br>● Summarize scientific texts to improve understanding of key evolutionary ideas.<br>● Use rereading strategies to clarify complex scientific concepts.<br>● Explain how new evidence can lead scientists to revise or choose between competing claims.<br>● Use visual and physical models to explain how shared and differing body structures relate to common ancestry.<br>● Explain that species can share body structures while also showing differences in those structures.<br>● Analyze how differences in body structures relate to differences in environmental conditions.<br>● Explain how geographic separation can cause one population to split into two distinct populations over time.<br>● Describe speciation as a process that can occur in any type of organism.<br>● Explain how natural selection causes different changes in populations living in different environments.<br>● Explain why body structures tend to remain stable when environments remain stable over long periods of time.<br>● Explain how environmental change can lead to changes in body structures through natural selection.<br>● Describe how many small changes can accumulate over long periods of time to produce large differences in species.<br>● Explain why the time humans have existed is very short compared to Earth's total history.<br>● Determine which species are most closely related by analyzing shared and unique body structures.<br>● Explain that among three species, the two that separated most recently are the most closely related.<br>● Use unique structures to infer evolutionary relationships among multiple species.<br>● Construct and interpret evolutionary tree diagrams based on shared and unique traits.<br>● Explain how specific fossil evidence can support claims about common ancestry.<br>● Analyze why scientists may disagree about how to classify fossil species.<br>● Explain why strong evidence is required to support claims about where a species belongs on an evolutionary tree.<br>● Evaluate multiple sources of evidence when considering evolutionary relationships.<br>● Use reasoning to explain how evidence supports claims about evolution and speciation. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| ● A physical model can be a useful tool for thinking about and explaining differences between body structures of organisms.<br>● A physical model does not have to look exactly like the thing it represents, as long as it clearly highlights the important elements.<br>● When two species share a structure that is not shared with a third species, this can be evidence that the first two species are more closely related to each other than to the third species.<br>● Scientists can use unique structures to decide how closely related two species are when considering them in relation to a third species, and they can use this information to create a representative evolutionary tree diagram.<br>● Scientists carefully examine all available evidence and choose the claim that they feel is better supported by the available evidence.<br>● A subset of reptiles, which includes modern birds and the ancestors of modern crocodiles, all share distinctive holes in their skull. This is evidence that these reptiles evolved from one common ancestor population.<br>● The scientific community does not always agree on how to classify a fossil species.<br>● Scientists must use strong evidence to support their claims about where a newly discovered species belongs on the evolutionary tree.<br>● Scientists must carefully consider all available evidence before making arguments about a phenomenon.<br>● Discussing evidence and ideas with others helps build new understanding.<br>● Scientists can change their minds when presented with convincing evidence. | ● Engage in scientific discussions to refine explanations and evaluate ideas.<br>● Explain why scientists may change their conclusions when presented with convincing new evidence. |

| Core Instructional & Supplemental Materials | |
|---|---|
| **Suggested Activities/Resources:**<br>● Articles in This Unit<br>○ “The Cat That Wasn’t a Cat at All”<br>○ “How You Are Like a Blue Whale”<br>○ Where Do Species Come From?<br>○ “Comparing Embryos: Evidence for Common Ancestors” | **Supplemental Materials**<br>● Digital Resources included in each unit<br>○ Evolutionary History Simulation<br>● Multi-language glossary<br>● Hands-On Flextension:<br>○ Reconstructing Owl Pellet Skeletons<br>○ Comparing Modern and Ancient Cephalopods |

| Suggested Accommodations |
|---|

| Grade: 8 | Content Area: Science |
|---|---|

**English Language Learners:**
- Multi-sensory instruction
- Flexible grouping
- Small group instruction
- Provide peer tutoring
- Use a strong student as a “buddy” (does not necessarily have to speak the primary language)
- Chunking information
- Scaffolded questioning
- Academic language support
- Vocabulary support
- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**
- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**
- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction

- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

**Economically Disadvantaged:**

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| **Unit 8:** Population and Resources | **Duration: 20 days** |
|---|---|

| **New Jersey Student Learning Standards** | |
|---|---|
| **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. |
| **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. |
| **MS-LS2-2** | Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. |

| Grade: 8 | Content Area: 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-ESS3-3** | Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. |

| Science and Engineering Practices | Discipline Core Ideas/Unit Enduring Understandings | Crosscutting Concepts |
|---|---|---|
| **Practice 1: Asking Questions**<br>● As students investigate the increase in moon jellies, their inquiry is guided by a series of strategic questions. They also have many opportunities to pose their own questions. In particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they read science articles.<br><br>**Practice 2: Developing and Using Models:**<br>● Students use a simulation, which is a model of an ecosystem, to gather evidence about how changes to one population affect other populations. Students also share ideas by completing visual models showing their ideas about how populations in an ecosystem affect one another.<br><br>**Practice 3: Planning and Carrying Out Investigations:**<br>● Students conduct investigations using the digital simulation, and with living yeast organisms to develop an understanding of changes | **LS2.A: Interdependent Relationships in Ecosystems:**<br>● Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and nonliving factors. (MS-LS2-1)<br><br>● Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)<br><br>● Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. 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).<br><br>● 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 | **Patterns**<br>● Patterns can be used to identify cause and effect relationships. (MS-LS2-2)<br><br>**Cause and Effect**<br>● Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)<br><br>**Energy and Matter**<br>● Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)<br>● The transfer of energy can be tracked as energy flows through a natural system (MS-LS2-3)<br><br>**Stability and Change**<br>● Small changes in one part of a system might cause large changes in another part. (MS-LS2-4), (MS-LS2-5)<br><br>**Connections to Engineering, Technology, and Applications of Science** |

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| in populations.<br><br>**Practice 4: Analyzing and Interpreting Data.**<br>● Throughout the unit, students analyze data about populations, particularly in the form of line graphs.<br><br>**Practice 5: Using Mathematics and Computational Thinking:**<br>● Students use mathematics and computational thinking to make sense of data about births, deaths, and population changes.<br><br>**Practice 6: Constructing Explanations:**<br>● Students learn about scientific explanations and have multiple opportunities to make increasingly complex explanations (and defend them through argumentation) over the course of the unit as they explain how the size of a population can change due to various factors such as being eaten and available energy for reproduction.<br><br>**Practice 7: Engaging in Argument from Evidence**<br>● Students receive support in evaluating evidence, engaging in scientific reasoning, and producing both oral and written arguments.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information**<br>● Students have multiple opportunities to engage in Active Reading, an approach to obtaining information from science texts. Students also evaluate evidence to determine its relevance to a particular claim. | constrains their growth and reproduction. (MS-LS2-1)<br><br>**LS2.B: Cycle of Matter and Energy Transfer in Ecosystems:**<br>● 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. (MS-LS2-3)<br><br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience:**<br>● 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)<br><br>● 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)<br><br>**LS4.D: Biodiversity and Humans:**<br>● 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)<br><br>**LS2.B: Cycle of Matter and Energy Transfer in Ecosystems:**<br>● Food webs are models that demonstrate how matter and energy is transferred between producers, | **Influence of Science, Engineering, and Technology on Society and the Natural World**<br>● The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (MS-LS2-5)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)<br><br>**Science Addresses Questions About the Natural and Material World**<br>● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge is Based on Empirical Evidence**<br>● Science disciplines share common rules of obtaining and evaluating empirical |

| | | |
|---|---|---|
| | consumers, and decomposers as the three groups interact within an ecosystem. (MS-LS2-3)<br><br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience:**<br>● 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)<br><br>● 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)<br><br>**LS4.D: Biodiversity and Humans:**<br>● 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) | evidence. (MS-LS2-4) |

| New Jersey Social and Emotional Competencies and Sub-Competencies | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals.<br>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |

| | |
|---|---|
| **Social Awareness** | • Recognize and identify the thoughts, feelings, and perspectives of others.<br>• Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>• Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>• Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | • Develop, implement, and model effective problem-solving and critical thinking skills.<br>• Identify the consequences associated with one's actions in order to make constructive choices.<br>• Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | • Establish and maintain healthy relationships.<br>• Utilize positive communication and social skills to interact effectively with others.<br>• Identify ways to resist inappropriate social pressure.<br>• Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>• Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |

| | |
|---|---|
| **MP5** | Use appropriate tools strategically. |
| **MP7** | Look for and make use of structure. |
| **8.EE.5** | Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. |

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| Career Readiness, Life Literacies & Key Skills | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |

| **Grade: 8** | **Content Area: Science** |
|---|---|

| | |
|---|---|
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

| **Evidence of Student Learning** | |
|---|---|
| **Formative Tasks:**<br>● Teacher observations<br>● Class discussions<br>● Whiteboard/Communicators<br>● On-the-Fly Assessments<br>● Daily classwork<br>● Checks for understanding<br>● Clipboard Assessment Tool<br>● Critical Juncture Assessment<br>● Crosscutting Concept Tracker | **Alternative Assessments:**<br>● Oral assessments<br>● Teacher-Created Projects<br>● https://www.khanacademy.org/<br>● Completion of webquests<br>● On-Line Laboratory activities<br>● Online assessment activities example:<br>○ Kahoot<br>○ Quizizz |
| **Summative Assessments:**<br>● Unit Tests<br>● Midterm Exam<br>● Final Exam<br>● Chapter/Unit Test<br>● Writing Assignments<br>● Presentations<br>● Laboratory Reports/Practical<br>● Unit Projects | **Benchmark Assessments:**<br>● Quarterly Benchmarks<br>● Beginning/End of Year Assessment<br>● Midterm Assessment<br>● Unit Common Assessment |

| **Knowledge & Skills** | |
|---|---|
| **Enduring Understandings:**<br>● Within a population organisms are always being born and dying. (1.2)<br>● A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change. (1.3)<br>● If the number of births and deaths in a given time are equal, then the population size will be stable. (1.3)<br>● If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease. (1.3)<br>● Organisms need to release energy from energy storage molecules in order to reproduce. (2.2) | **Essential Questions:**<br>● Why do populations change size in an ecosystem?<br>● What caused the size of the moon jelly population in Glacier Sea to increase?<br>● How do births and deaths in a population affect its size?<br>● What could have caused the births to increase or the deaths to decrease in the moon jelly population?<br>● What can change the number of births in a population?<br>● What can change the number of deaths in a population?<br>● How could a population besides the zooplankton or sea turtles have caused the moon jelly population to increase?<br>● What can affect the size of a population besides its resource or consumer populations? |

| | |
|---|---|
| ● Organisms in consumer populations get energy storage molecules from eating organisms in resource populations. (2.2)<br>● The more energy storage molecules available to a population, the more the organisms in that population can reproduce. (2.2)<br>● The larger the resource population, the more energy storage molecules are available for its consumer populations. (2.3)<br>● The larger the consumer population, the more energy storage molecules it will need. Therefore, it will eat more, causing more deaths in the resource population. (2.4)<br>● Two populations can compete for the same resource population. A change to one of these populations affects the size of the other. (3.2)<br>● The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected. (3.3) | ● What was the main cause of the decrease in the size of the orange-bellied parrot population? |
| **Content**<br>*Students will know…*<br>● An ecosystem includes all the living and nonliving things in a particular area.<br>● An ecologist is a scientist who studies interactions of organisms with one another and their environment.<br>● A population is a group of the same type of organism living in the same area.<br>● Many ecologists study changes in the size of populations.<br>● Within a population organisms are always being born and dying.<br>● A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change.<br>● If the number of births and deaths in a given time are equal, then the population size will be stable.<br>● If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease.<br>● Ecologists collect samples to learn about a population.<br>● Samples that represent as much of the whole population as possible provide stronger evidence.<br>● Science disciplines share common rules of obtaining and evaluating empirical evidence. | **Skills**<br>*Students will be able to …*<br>● Define an ecosystem as the interaction of living and nonliving components in a particular area.<br>● Explain the role of an ecologist in studying interactions among organisms and their environment.<br>● Define a population as a group of the same type of organism living in the same area.<br>● Explain why population sizes change over time as organisms are born and die.<br>● Describe how a system can remain stable even when matter or energy is added and removed.<br>● Explain how equal numbers of births and deaths result in a stable population size.<br>● Predict how population size changes when births exceed deaths or deaths exceed births.<br>● Explain how ecologists use sampling to study populations.<br>● Evaluate whether a sample represents a population accurately.<br>● Explain why larger, more representative samples provide stronger evidence.<br>● Explain that organisms require energy storage molecules to survive and reproduce.<br>● Describe how consumer populations obtain energy storage molecules from resource populations.<br>● Explain how the availability of energy storage molecules affects reproduction in a population.<br>● Use food webs to identify energy flow and feeding relationships among populations.<br>● Analyze how changes in resource population size affect consumer populations. |

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| ● Energy storage molecules are molecules that organisms can use to release the energy they need to survive.<br>● A consumer population is a group of organisms that eats organisms from another population.<br>● Organisms need to release energy from energy storage molecules in order to reproduce.<br>● Organisms in consumer populations get energy storage molecules from eating organisms in resource populations.<br>● The more energy storage molecules available to a population, the more the organisms in that population can reproduce.<br>● Food webs are a way to show eating relationships in an ecosystem.<br>● The larger the resource population, the more energy storage molecules are available for its consumer populations.<br>● The larger the consumer population, the more energy storage molecules it will need. Therefore, it will eat more, causing more deaths in the resource population.<br>● Ecologists must consider different aspects of a sample to make sure that it represents a whole population well.<br>● A population is connected to other populations in addition to its consumer and resource populations on a food web.<br>● Populations sometimes compete for the same resources.<br>● Two populations can compete for the same resource population. A change to one of these populations affects the size of the other.<br>● The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected.<br>● Scientists revise their claims based on new evidence.<br>● Science findings are frequently revised and/or reinterpreted based on new evidence.<br>● Some ecosystems have populations that only live there and no place else on Earth.<br>● Ecologists can apply what they know about the interactions in one ecosystem to determine interactions in another ecosystem.<br>● Scientists must carefully consider all available evidence before making arguments about a phenomenon.<br>● Discussing evidence and ideas with others helps build new understanding.<br>● Scientists can change their minds when presented with convincing evidence. | ● Analyze how increases in consumer populations can reduce resource populations.<br>● Explain how populations are connected to multiple other populations within a food web.<br>● Explain how competition occurs when populations rely on the same resources.<br>● Analyze how changes in one population can affect other populations, even if they are not directly connected.<br>● Use cause-and-effect reasoning to explain population changes within an ecosystem.<br>● Apply knowledge from one ecosystem to predict interactions in another ecosystem.<br>● Explain why some ecosystems contain populations found nowhere else on Earth.<br>● Evaluate evidence to support or revise claims about population changes.<br>● Explain why scientific explanations are revised when new evidence becomes available.<br>● Use reasoning to connect evidence to claims about population dynamics and resource availability.<br>● Construct a scientific explanation or argument that includes a claim, evidence, and reasoning.<br>● Participate in scientific discussions to clarify ideas and improve explanations.<br>● Explain why scientists must consider all available evidence before drawing conclusions.<br>● Explain how collaboration and discussion help build scientific understanding. |

| **Grade: 8** | **Content Area: Science** |
|---|---|

## Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

- Articles in This Unit
  - The Arctic Ecosystem article set
  - "How Ecosystems Clean Earth's Water"
  - Reproduction and Energy article set
  - "Jelly Population Explosion: How Competition Can Affect Population Size"
  - "The Ant and the Acacia"

**Supplemental Materials**

- Digital Resources included in each unit
  - "The Ant and the Acacia"
- Multi-language glossary
- Hands-On Flextension:
  - Measuring Nonliving Factors in Ecosystems

## Suggested Accommodations

**English Language Learners:**

- Multi-sensory instruction
- Flexible grouping
- Small group instruction
- Provide peer tutoring
- Use a strong student as a "buddy" (does not necessarily have to speak the primary language)
- Chunking information
- Scaffolded questioning
- Academic language support
- Vocabulary support
- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

**Special Education/Students with Disabilities:**

- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**

- Allow extra time to complete assignments or tests
- Work in a small group

- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**
- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**
- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

**Economically Disadvantaged:**
- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**
- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

| **Grade: 8** | **Content Area: Science** |
|---|---|

| **Unit 9:** Matter and Energy in Ecosystems | **Duration: 20 days** |
|---|---|

| **New Jersey Student Learning Standards** | |
|---|---|
| **MS-LS 1-2** | Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. |
| **MS-LS 1-6** | 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. |
| **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. |
| **MS-LS2-2** | Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. |
| **MS-LS 2-3** | Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. |
| **MS-LS 2-4** | Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. |
| **MS-ESS2-1** | Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. |
| **MS-ESS3-5** | Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. |
| **MS-PS1-1** | Develop models to describe the atomic composition of simple molecules and extended structures. |
| **MS-PS1-6** | Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. |

| **Science and Engineering Practices** | **Discipline Core Ideas/Unit Enduring Understandings** | **Crosscutting Concepts** |
|---|---|---|
| **Practice 1: Asking Questions**<br>● As students investigate what caused the biodome to collapse, their inquiry is guided by a series of strategic questions. They also have many opportunities to pose their own questions. In | **LS1.C: Organization for Matter and Energy Flow in Organisms:**<br>● Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere | **Patterns**<br>● Patterns can be used to identify cause and effect relationships. (MS-LS2-2)<br><br>**Scale, Proportion, and Quantity**<br>● Phenomena that can be |

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| particular, the Active Reading approach, an approach to reading based on curiosity and inquiry, supports students in asking thoughtful questions as they read science articles.<br><br>**Practice 2: Developing and Using Models:**<br>● Students spend extensive time exploring and investigating with the Matter and Energy in Ecosystems Simulation, which models how carbon moves through an ecosystem from carbon dioxide in abiotic matter into energy storage molecules and through the various trophic levels of biotic matter. Students also use a digital modeling tool to create models that show their ideas about how carbon moves through an ecosystem.<br><br>**Practice 4: Analyzing and Interpreting Data.**<br>● Students analyze data about total amounts of carbon in an ecosystem, the amounts of carbon in biotic and abiotic matter, population data, and sunlight data. They learn to read graphs and apply their analysis to support scientific arguments.<br><br>**Practice 6: Constructing Explanations:**<br>● Students learn about scientific explanations and have multiple opportunities to make increasingly complex explanations (and defend them through argumentation) over the course of the unit as they explain what caused the biodome to collapse.<br><br>**Practice 7: Engaging in Argument from Evidence** | 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)<br><br>**LS2.A: Interdependent Relationships in Ecosystems.**<br>● 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)<br><br>**LS2.B: Cycle of Matter and Energy Transfer in Ecosystems:**<br>● 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 | observed at one scale may not be observable at another scale. (MS-LS1-1)<br><br>**Energy and Matter**<br>● Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)<br>● Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)<br>● The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)<br><br>**Stability and Change**<br>● Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)<br>● Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)<br>● Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)<br><br>**Connections to Engineering, Technology, and Applications of Science**<br><br>**Interdependence of Science, Engineering, and Technology**<br>● Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of |

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| ● Students receive instruction about the structure of a scientific argument and are supported in evaluating evidence, engaging in scientific reasoning, and producing both oral and written arguments.<br><br>**Practice 8: Obtaining, Evaluating, and Communicating Information**<br>● Students have multiple opportunities to engage in Active Reading, an approach to obtaining information from science texts. | nonliving parts of the ecosystem. (MS-LS2-3)<br><br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience:**<br>● 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)<br><br>**PS3.D: Energy in Chemical Processes and Everyday Life:**<br>● 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)<br><br>● 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)<br><br>**LS1.A: Structure and Function:**<br>● 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)<br><br>**ESS2.A: Earth's Materials and Systems:**<br>● All Earth processes are the result of energy flowing and | entire industries and engineered systems. (MS-LS1-1)<br><br>**Connections to Nature of Science**<br><br>**Scientific Knowledge is Based on Empirical Evidence**<br>● Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)<br>● Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)<br><br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3) |

| Grade: 8 | Content Area: Science |
|---|---|

| | | |
|---|---|---|
| | 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)<br><br>**ESS3.D: Global Climate Change:**<br>● 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)<br><br>**PS1.A: Structure and Properties of Matter:**<br>● Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)<br><br>**PS1.B: Chemical Reactions:**<br>● Some chemical reactions release energy, others store energy. (MS-PS1-6) | |

| New Jersey Social and Emotional Competencies and Sub-Competencies |
|---|

| Grade: 8 | Content Area: Science |
|---|---|

| | |
|---|---|
| **Self-Awareness** | ● Recognize one's feelings and thoughts.<br>● Recognize the impact of one's feelings and thoughts on one's own behavior.<br>● Recognize one's personal traits, strengths, and limitations.<br>● Recognize the importance of self-confidence in handling daily tasks and challenges. |
| **Self-Management** | ● Understand and practice strategies for managing one's own emotions, thoughts, and behaviors.<br>● Recognize the skills needed to establish and achieve personal and educational goals.<br>● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals. |
| **Social Awareness** | ● Recognize and identify the thoughts, feelings, and perspectives of others.<br>● Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds.<br>● Demonstrate an understanding of the need for mutual respect when viewpoints differ.<br>● Demonstrate an awareness of the expectations for social interactions in a variety of settings. |
| **Responsible Decision Making** | ● Develop, implement, and model effective problem-solving and critical thinking skills.<br>● Identify the consequences associated with one's actions in order to make constructive choices.<br>● Evaluate personal, ethical, safety, and civic impact of decisions. |
| **Relationship Skills** | ● Establish and maintain healthy relationships.<br>● Utilize positive communication and social skills to interact effectively with others.<br>● Identify ways to resist inappropriate social pressure.<br>● Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways.<br>● Identify who, when, where, or how to seek help for oneself or others when needed. |

| Interdisciplinary Connections | |
|---|---|
| **ELA Standards** | |
| **RL.CR.8.1** | Cite a range of textual evidence and make clear and relevant connections to strongly support an analysis of multiple aspects of what a literary text says explicitly as well as inferences drawn from the text. |
| **RI.CI.8.2** | Determine a central idea of an informational text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. |
| **RL.TS.8.4** | Compare and contrast the structure of texts, analyzing how the differing |

| | |
|---|---|
| | structure of each text contributes to its meaning, tone and style. |
| **SL.II.8.2** | Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. |
| **W.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.IW.8.2** | 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.IW.8.2.A** | Introduce a topic clearly, previewing what is to follow; and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aid in comprehension. |
| **W.AW.8.1** | 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.AW.8.1.A** | Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. |
| **W.AW.8.1.B** | Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. |
| **W.IW.8.2** | 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.IW.8.2.D** | Use precise language and domain/grade-level- specific vocabulary to inform about or explain the topic. |
| **W.WR.8.5** | 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. |
| **W.SE.8.6** | 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.8.7** | 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. |
| **Mathematics Standards** | |
| **MP1** | Make sense of problems and persevere in solving them. |
| **MP2** | Reason abstractly and quantitatively. |
| **MP3** | Construct viable arguments and critique the reasoning of others. |
| **MP4** | Model with mathematics. |
| **MP5** | Use appropriate tools strategically. |
| **8.F.5** | Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. |

| Computer Science & Design Thinking | |
|---|---|
| **8.2.8.ITH.1** | Explain how the development and use of technology influences economic, political, social, and cultural issues. |
| **8.2.8.ED.2** | Identify the steps in the design process that could be used to solve a problem. |
| **8.2.8.NT.3** | Examine a system, consider how each part relates to other parts, and redesign it for another purpose. |
| **8.2.8.ETW.4** | Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best |
| **8.2.8.EC.2** | Examine the effects of ethical and unethical practices in product design and development. |

| Career Readiness, Life Literacies & Key Skills | |
|---|---|
| **9.1.8.CR.2** | Compare various ways to give back through strengths, passions, goals, and other personal factors. |
| **9.1.8.PB.5** | Identify factors that affect one's goals, including peers, culture, location, and past experiences. |
| **9.2.8.CAP.2** | Develop a plan that includes information about career areas of interest. |

| **Grade: 8** | **Content Area: Science** |
|---|---|

| | |
|---|---|
| **9.2.8.CAP.12** | Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential |
| **9.4.8.CI.1** | Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). |
| **9.4.8.CT.2** | Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1) |
| **9.4.8.DC.1** | Analyze the resource citations in online materials for proper use. |
| **9.4.8.DC.4** | Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. |
| **9.4.8.IML.4** | Ask insightful questions to organize different types of data and create meaningful visualizations. |

## Evidence of Student Learning

**Formative Tasks:**
- Teacher observations
- Class discussions
- Whiteboard/Communicators
- On-the-Fly Assessments
- Daily classwork
- Checks for understanding
- Clipboard Assessment Tool
- Critical Juncture Assessment
- Crosscutting Concept Tracker

**Alternative Assessments:**
- Oral assessments
- Teacher-Created Projects
- https://www.khanacademy.org/
- Completion of webquests
- On-Line Laboratory activities
- Online assessment activities example:
  - Kahoot
  - Quizizz

**Summative Assessments:**
- Unit Tests
- Midterm Exam
- Final Exam
- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Reports/Practical
- Unit Projects

**Benchmark Assessments:**
- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Midterm Assessment
- Unit Common Assessment

## Knowledge & Skills

**Enduring Understandings:**
- Carbon is part of carbon dioxide, which is abiotic matter. Carbon is also part of energy

**Essential Questions:**
- How do all the organisms in an ecosystem get the resources they need to release energy?

| | |
|---|---|
| storage molecules, which are biotic matter. (1.4, 1.5)<br>● During the process of photosynthesis, producers make energy storage molecules, using carbon from carbon dioxide and energy from sunlight. This moves carbon from abiotic to biotic matter. (1.4)<br>● If one part of a system changes, this affects the rest of the system. (1.5)<br>● When there is more carbon (in the form of carbon dioxide) in abiotic matter, more carbon is available to producers for making energy storage molecules. (1.6)<br>● When there is less carbon (in the form of carbon dioxide) in abiotic matter, less carbon is available to producers for making energy storage molecules. (1.6)<br>● When there is more sunlight, producers can make more energy storage molecules from the carbon in carbon dioxide. (1.6)<br>● When there is less sunlight, producers cannot make as many energy storage molecules from the carbon in carbon dioxide. (1.6)<br>● As organisms release energy during cellular respiration, carbon dioxide is produced from the carbon in energy storage molecules. This process moves carbon from biotic to abiotic matter. (2.3)<br>● Since carbon cannot be produced or used up, the total amount of carbon in a closed ecosystem does not change. (3.3)<br>● If the amount of carbon increased in abiotic matter, then it also decreased in biotic matter. If the amount of carbon decreased in abiotic matter, then it also increased in biotic matter. (3.3) | ● Why didn't the plants and animals in the biodome have enough energy storage molecules?<br>● Where do the energy storage molecules in an ecosystem come from?<br>● What factors affect how many energy storage molecules producers are able to make?<br>● What caused carbon dioxide to decrease in the air (abiotic matter) of the biodome?<br>● Where does the carbon dioxide in abiotic matter come from?<br>● How do organisms give off carbon dioxide?<br>● What happened to the carbon that used to be in the air (abiotic matter) of the biodome?<br>● If the amount of carbon changed in one part of a closed ecosystem, what happened to the carbon in the rest of the ecosystem?<br>● Why does deforestation lead to increased carbon dioxide in the air? |
| **Content**<br>*Students will know…*<br>● A system is a set of interacting parts, forming a complex whole.<br>● Ecosystems are made up of living and nonliving things that interact in a particular area.<br>● The organisms in an ecosystem cannot grow or reproduce if they do not have enough energy storage molecules.<br>● Reading actively means thinking about one's own understanding as one reads.<br>● Using the strategy of summarizing chunks of text as you read ensures better understanding. | **Skills**<br>*Students will be able to …*<br>● Define a system as a set of interacting parts that form a complex whole.<br>● Explain how ecosystems function as systems made up of interacting living and nonliving components.<br>● Explain why organisms need energy storage molecules in order to grow and reproduce.<br>● Use active reading strategies, such as summarizing sections of text, to improve understanding of complex scientific ideas.<br>● Explain how producers use sunlight and carbon dioxide to make energy storage molecules through photosynthesis. |

| | |
|---|---|
| ● Producers use carbon dioxide as well as energy from sunlight to make energy storage molecules.<br>● Carbon is part of carbon dioxide, which is abiotic matter. Carbon is also part of energy storage molecules, which are biotic matter.<br>● During the process of photosynthesis, producers make energy storage molecules, using carbon from carbon dioxide and energy from sunlight. This moves carbon from abiotic to biotic matter.<br>● Scientists use visual representations to help explain ideas.<br>● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.<br>● The amounts of available sunlight and carbon dioxide influence the amount of energy storage molecules in biotic matter.<br>● Scientists use physical and visual models to construct and explain their ideas.<br>● If one part of a system changes, this affects the rest of the system.<br>● When there is more carbon (in the form of carbon dioxide) in abiotic matter, more carbon is available to producers for making energy storage molecules.<br>● When there is less carbon (in the form of carbon dioxide) in abiotic matter, less carbon is available to producers for making energy storage molecules.<br>● When there is more sunlight, producers can make more energy storage molecules from the carbon in carbon dioxide.<br>● When there is less sunlight, producers cannot make as many energy storage molecules from the carbon in carbon dioxide.<br>● Reasoning is a process that scientists use to connect evidence to their claims.<br>● Producers, consumers, and decomposers give off carbon dioxide to abiotic matter.<br>● Cellular respiration is the chemical reaction between oxygen and energy storage molecules, such as glucose, that releases energy into cells.<br>● All living organisms do cellular respiration and give off carbon dioxide.<br>● Cellular respiration is not affected by the amount of sunlight in an ecosystem.<br>● As organisms release energy during cellular respiration, carbon dioxide is produced from | ● Distinguish between abiotic matter and biotic matter using carbon as an example.<br>● Explain how photosynthesis moves carbon from abiotic matter to biotic matter.<br>● Use visual and physical models to represent the movement of matter and energy in ecosystems.<br>● Explain how the availability of sunlight affects the amount of energy storage molecules producers can make.<br>● Explain how the availability of carbon dioxide affects the amount of energy storage molecules producers can make.<br>● Use systems thinking to explain how a change in one part of an ecosystem affects other parts.<br>● Explain how producers, consumers, and decomposers release carbon dioxide into abiotic matter.<br>● Describe cellular respiration as a chemical reaction that releases energy from energy storage molecules.<br>● Explain why all living organisms carry out cellular respiration.<br>● Explain how cellular respiration moves carbon from biotic matter to abiotic matter.<br>● Explain why the rate of cellular respiration in an ecosystem depends on the number of organisms present.<br>● Explain why cellular respiration is not directly affected by the amount of sunlight in an ecosystem.<br>● Explain that Earth functions as a closed system with respect to carbon.<br>● Explain why the total amount of carbon in a closed ecosystem remains constant over time.<br>● Analyze how carbon can shift between abiotic and biotic matter without being created or destroyed.<br>● Explain how photosynthesis and cellular respiration work together to cycle carbon through an ecosystem.<br>● Explain how fossil fuels form and how burning them changes the distribution of carbon in Earth's system.<br>● Analyze how burning fossil fuels increases carbon dioxide in the atmosphere.<br>● Explain how deforestation affects carbon levels in abiotic and biotic matter.<br>● Use cause-and-effect reasoning to explain how changes in carbon availability affect ecosystems.<br>● Explain that a single cause can have multiple effects and that a single effect can have multiple causes.<br>● Use data and observations from investigations to explain matter and energy movement in ecosystems.<br>● Evaluate multiple pieces of evidence when developing explanations about ecosystem processes. |

| | |
|---|---|
| the carbon in energy storage molecules. This process moves carbon from biotic to abiotic matter.<br>● The amount of cellular respiration in an ecosystem depends on the number of organisms in the ecosystem.<br>● Earth is a closed system, so the amount of carbon stays relatively constant over time.<br>● Dead matter that has been buried deep underground for a long time may form fossil fuels, which can be burned to power things people need.<br>● Burning fossil fuels adds more carbon dioxide to Earth's atmosphere, increasing carbon in abiotic matter and decreasing carbon in biotic matter.<br>● In a closed ecosystem, carbon cannot be produced or used up.<br>● The amounts of carbon in the different parts of an ecosystem can change, but the total amount of carbon in a closed ecosystem remains constant.<br>● The processes of photosynthesis and cellular respiration move carbon from abiotic to biotic and from biotic to abiotic parts of an ecosystem.<br>● Since carbon cannot be produced or used up, the total amount of carbon in a closed ecosystem does not change.<br>● If the amount of carbon increased in abiotic matter, then it also decreased in biotic matter. If the amount of carbon decreased in abiotic matter, then it also increased in biotic matter.<br>● A cause is why something happened; an effect is what happened.<br>● A cause can have more than one effect and an effect can have more than one cause.<br>● Science investigations use a variety of methods and tools to make measurements and observations.<br>● Deforestation causes an increase in carbon dioxide in the atmosphere.<br>● Scientists must carefully consider all available evidence before making arguments about a phenomenon.<br>● Discussing evidence and ideas with others helps build new understanding.<br>● Scientists can change their minds when presented with convincing evidence.<br>● In order to convince your readers, a written scientific argument needs to state a claim, | ● Use reasoning to connect evidence to claims about matter and energy cycling.<br>● Construct a written scientific argument that includes a claim, supporting evidence, and clear reasoning.<br>● Engage in scientific discussions to refine ideas and improve explanations.<br>● Explain why scientists revise explanations when new or stronger evidence becomes available. |

| | |
|---|---|
| describe specific evidence, and explain how the evidence supports the claim.<br>● A claim can sometimes be supported more effectively if you consider the combination of several different pieces of evidence. | |

## Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

- Articles in This Unit
  - Biodome Files article set
  - "What Is Carbon?"
  - Sunlight and Life article set
  - "Where Did Chloroplasts Come From?"
  - A Feast for Decomposers article set
  - "The Mulberry Tree and the Silkworm"
  - "How Did We Get Mitochondria?"
  - Ecosystem Claims article set ("Getting Energy in a Cave Ecosystem," "Getting Energy in a Coastal Prairie Ecosystem," and "Getting Energy Near a Deep-Sea Vent.")
  - "Glacier Mice: Living Arctic Tumbleweeds"
  - "Carbon in the Global Ecosystem"

**Supplemental Materials**

- Digital Resources included in each unit
  - Matter and Energy in Ecosystems Simulation
- Multi-language glossary
- Hands-On Flextension:
  - Plant Growth Investigations
  - Biodome Design Challenge

## Suggested Accommodations

**English Language Learners:**

- Multi-sensory instruction
- Flexible grouping
- Small group instruction
- Provide peer tutoring
- Use a strong student as a "buddy" (does not necessarily have to speak the primary language)
- Chunking information
- Scaffolded questioning
- Academic language support
- Vocabulary support
- Co-Constructed Word Banks
- Anchor charts
- Gradual release model
- Visual models
- Native language support when possible (Multi-language glossary)
- Sheltered English Instruction Strategies
- Sentence starters

| Grade: 8 | Content Area: Science |
|---|---|

**Special Education/Students with Disabilities:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Follow all IEP modifications
- Calculators
- Manipulatives/concrete models
- Directions repeated, clarified, and reworded
- Breakdown task into manageable parts

**504 Plans:**
- Allow extra time to complete assignments or tests
- Work in a small group
- Allow answers to be given orally or dictated
- Calculators
- Manipulatives/concrete models
- Follow all 504 modifications

**Gifted and Talented:**
- Higher level questioning
- Enriched assignments
- Tiered assignments
- Choice board to extend learning

**Students at Risk of Failure:**
- Provide peer tutoring
- Use a strong student as a “buddy”
- Allow extra time to complete assignments or tests
- Work in a small group
- One on one instruction
- Provide immediate praise and feedback
- Create a nurturing environment
- Provide visuals
- Be flexible with assignments and time frames
- Provide needed academic resources
- Chunking information
- Scaffolded questioning
- Tiered activities
- Manipulatives/concrete models
- Modified assignments
- Brain breaks

**Economically Disadvantaged:**
- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words

- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

**Culturally Diverse:**

- Create an emotionally positive classroom climate.
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background