Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:
Meeting the needs of all students with a proud tradition of academic excellence.

DEPARTMENT: Science COURSE: Science, Grade 7

Curriculum Development Timeline

School: Township of Ocean Intermediate School

Course: Science, Grade 7

Department: Science

Board Approval	Supervisor	Notes
December 2008	Patrick Sullivan	Born Date
August 2011	Patrick Sullivan	Revisions
May 2015	Patrick Sullivan	Revisions
July 2017	Patrick Sullivan	Revisions
March 2019	Patrick Sullivan	Review
August 2021	Patrick Sullivan	Alignment to Standards and Revisions
August 2022	Patrick Sullivan	Incorporate State Mandates
August 2024	Patrick Sullivan	Updated to include New State Mandates

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DEPARTMENT: Science

COURSE: Science, Grade 7

Township of Ocean Pacing Guide			
Week	**Quarter 1**	**Week**	**Quarter 3**
1	Course Intro./Science as a Process	21	Ecological Interactions
2	Science as a Process	22	Genetics & Medical Technologies
3	Science as a Process	23	Genetics & Medical Technologies
4	Science as a Process	24	Genetics & Medical Technologies
5	Cell Parts, Functions & Organization	25	Genetics & Medical Technologies
6	Cell Parts, Functions & Organization	26	Genetics & Medical Technologies
7	Cell Parts, Functions & Organization	27	Natural Selection & Evolution
8	Cell Parts, Functions & Organization	28	Natural Selection & Evolution
9	Cell Parts, Functions & Organization	29	Natural Selection & Evolution
10	Cell Parts, Functions & Organization	30	Natural Selection & Evolution
Week	**Quarter 2**	**Week**	**Quarter 4**
11	Cell Parts, Functions & Organization	31	Buffer Week: Benchmark/ Biology Final
12	Cell Parts, Functions & Organization	32	PLTW: Energy and the Environment Unit: Investigating Energy
13	Cell Parts, Functions & Organization	33	PLTW: Energy and the Environment Unit: Investigating Energy
14	Cell Parts, Functions & Organization	34	PLTW: Energy and the Environment Unit: Investigating Energy
15	Cell Parts, Functions & Organization	35	PLTW: Energy and the Environment Unit: Sustainable Energy

Home of the Spartans!
#spartanlegacy

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16	Cell Parts, Functions & Organization	36	PLTW: Energy and the Environment Unit: Sustainable Energy
17	Cell Parts, Functions & Organization	37	PLTW: Energy and the Environment Unit: Sustainable Energy
18	Ecological Interactions	38	PLTW: Energy and the Environment Unit: Making an Impact
19	Ecological Interactions	39	PLTW: Energy and the Environment Unit: Making an Impact
20	Ecological Interactions	40	PLTW: Energy and the Environment Unit: Making an Impact

Climate Change: Energy and the Environment (NJSLS-S: MS-ESS3-5)

Core Instructional & Supplemental Materials including various levels of Texts
Texts: Glencoe-2012----I-Science: Interactions of Life (CP) Glencoe-2012----I-Science: Structure + Function (Accelerated) **Digital Resources Across All Levels**: (D=differentiated) BioDigital Human (D) Edpuzzle (D) Gizmo (D) Generation Genius (D) Gimkits Science World Articles Youtube Streaming Videos PhET Interactive Simulations (D) Ted Talks

Time Frame	**Unit 1 (4 weeks)**
Topic	
Science as a Process	

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Alignment to Standards

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 modifications of a proposed object, tool, or process such that an optimal design can be achieved.

Learning Objectives and Activities

Learning Objectives:

- How do scientists design controlled experiments to answer scientific questions?
- How do scientists analyze and interpret data to determine similarities and differences in findings?
- How do scientists communicate ideas and evaluate competing design solutions?

Learning Activities:

- Grabbing Some Teamwork/Structure Challenge
- Lab Safety Contact/Mishaps Activity
- There's a Graph for That! Activity
- Analyze THIS! Graphing & Data Table Practice
- Can You See It? Observation Activity
- What Specimen is That? Activity
- See It. Say It. Build It. Compare It. Lab
- Little Black Box of Science Lab
- Scientific Cents
- Putting It All Together
- Passing Judgment Activity
- How Many Times?/Don't Burst My Bubble Lab
- Gizmo: Germination
- Controlled Experiment of your Choice Project

Assessments

Formative:

- Pre-lab Investigation and Review/Practice Questions
- CER exit slips
- Make, use and interpret different types of graphs
- Use scientific tools to make observations and record qualitative and quantitative data

- Observational Assessment/Lab Participation

Summative:
- Writing Tasks: Inquiry Lab Reports
- Analyze scientific data to draw conclusions
- Understand the various ways scientific research is communicated.

Benchmark: N/A

Alternative:
- Journal Entries: “Do Now and Wrap-up” participation
- Design a controlled experiment to answer a scientific question based on student interest

Interdisciplinary Connections

New Jersey Student Learning Standards

ELA:
RI.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what an informational text says explicitly, as well as inferences drawn from the text.
W.AW.7.1. Write arguments on discipline-specific content (e.g. social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
SL.II.7.2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

Mathematics:
7.NS.B.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

Career Readiness, Life Literacies, and Key Skills

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change,and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).

Technology Integration

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DEPARTMENT: Science COURSE: Science, Grade 7

8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

Career Education

CRP-2. Apply appropriate academic and technical skills.
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**Unit 2 (13 weeks)**

Topic

Cell Parts, Functions, & Organization

Alignment to 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 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-LS1-6: 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-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.
MS-LS1-4: Explain how characteristic animal behaviors affect the probability of successful reproduction.
MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Learning Objectives and Activities

Learning Objectives:

- What are the characteristics of all living things?
- What are the similarities and differences between prokaryotic and eukaryotic cells?

- What are the major organelles in bacteria, plant and animal cells? What disorders and/or diseases can be caused when an organelle is not functioning properly?
- What are the similarities and differences between bacteria and viruses and what diseases can they cause?
- 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.

Learning Activities:

Characteristics of Life

- Lost at Sea Activity
- Characteristics of Life INB Flipbook
- Homeostasis Lab - Heart Rate
- Gizmo: Human Homeostasis
- Response to Stimuli Lab
- Gizmo: Sight vs. Sound Reaction

Cell History/Parts & Function

- History of the Cell Theory Flipbook & Basic Cell Substances Research
- Lipids Lab/Chemical Identification Tests Flipbook
- CSI Food Analysis Lab
- Life Under the Microscope Reading
- Gizmo: Cell Types
- Bacteria Characteristics Chart & Diagram/Name that Bacteria! Activity
- BrainPop: Antibiotics
- Prokaryote Wanted Project Bacteria Flipbook/Instagerm Project
- Gizmo: Cell Structure
- Cell Comparison Color by Number
- Microscope Madness Notes/Lab
- Cell Organelles - Animal or Plant?
- Plant VS Animal Cell Flipbooks
- Cell Processes: Why are Cells So Small? Lab
- Battle for Planet Earth: The Structure & Function of Cells Project

Cell Processes

- What do Cells do Anyway? Reading
- Smell Test Demo/Moving Across a Membrane Lab
- Egg-Speriment
- Move It! Lab
- Osmosis Application Scenarios + Effects of Osmosis on Cells Chart
- Gizmos: Diffusion & Osmosis

DEPARTMENT: Science COURSE: Science, Grade 7

- Gizmo: Photosynthesis Virtual Lab
- Respiration Flipbook/Graphic Organizer
- Gizmo: Cell Energy Cycle Virtual Lab
- Gizmo: Plants and Snails Virtual Lab
- Lactic Acid Fermentation Lab
- Yeast on the Rise Lab
- Photosynthesis & Respiration Edpuzzle
- Cell Mitosis: Flipping Out Over Cell Division
- Gizmo: Cell Division
- Cell Cycle: Onion & Blastula Fish Virtual Lab
- Cell Cycle Spinner

Cellular Organization
- Human Body Pre-Assessment and Word Dissections
- The Human Body: The Insiders Look Reading

Assessments

Formative:
- Pre-lab Investigation and Review/Practice Questions
- Exit slips on cell functions
- Observational Assessment/Lab Participation
- Lab Analysis Questions

Summative:
- Writing Tasks: Inquiry Lab Reports
- Body Systems Project
- Cell Processes application scenarios

Benchmark: N/A

Alternative:
- Journal Entries: “Do Now and Wrap-up” participation
- Photosynthesis Flipbook/Graphic Organizer
- Cellular Transport Foldable
- Cell Project Brochure

Interdisciplinary Connections

New Jersey Student Learning Standards

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DEPARTMENT: Science COURSE: Science, Grade 7

ELA:
W.AW.7.1. Write arguments on discipline-specific content (e.g. social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
RI.AA.7.7: Trace and evaluate the argument and specific claims in a text, assessing the reasoning is sound and the evidence is relevant and sufficient to support the claims.
W.SE.7.6: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
SL.II.7.2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

Mathematics:
7.NS.B.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

Career Readiness, Life Literacies, and Key Skills

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change,and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
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.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
9.1.5.TL.2 Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).

Technology Integration

8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

Career Education

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DEPARTMENT: Science COURSE: Science, Grade 7

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**Unit 3 (4 weeks)**

Topic

Ecological Interactions

Alignment to Standards

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.
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.

Learning Objectives and Activities

Learning Objectives:

- What are the levels of organization in nature?
- How are ecosystems affected by both biotic and abiotic factors?
- What are examples of competition, predation, mutualism, commensalism, and parasitism in nature?
- What is the difference between producers, primary, secondary, tertiary consumers, and decomposers and why are they important to their ecosystem?
- What is the difference between a food chain and a food web?

Learning Activities:

- Interactions Within the Environment Reading/Review Questions
- What's in an Ecosystem? It's a Frog's World + Ecosystem Choice Project Research

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- Species Characteristics Chart/You Are What You Eat! Graphic Organizer
- Food Chain/Food Web Ecology Project
- A Pyramid of Energy Graphic Organizer/Stacking it Up Activity
- Why Can't We All Just Get Along? Graphic Organizer/Symbiotic Relationships Card Sort + Apply to Project
- Ecological Interactions: Symbiosis Want Ad
- Analyzing Predator-Prey Relationships Activity
- Monsters in the Forest - A Game of Biodiversity
- Threats to my Ecosystem Research Activity
- Ecology PowerPoints & Presentations
- Gizmos: Rabbit Population by Season, Prairie Ecosystem, Forest Ecosystem

Assessments

Formative:

- Pre-lab Investigation and Review/Practice Questions
- Describe how ecosystems are affected by both biotic and abiotic factors
- Describe how living things interact with one another
- Observational Assessment/Lab Participation

Summative:

- Writing Tasks: Inquiry Lab Reports
- Create a food web that describes the transfer of energy in an ecosystem
- Predict the consequences of drastic changes to the population of individual organisms in an ecosystem
- Create a food web that describes the transfer of energy in an ecosystem

Benchmark: N/A

Alternative:

- Journal Entries: "Do Now and Wrap-up" participation
- Threats to my Ecosystem Research Activity
- Discuss the levels of organization in nature and differentiate between organisms, populations, communities, and ecosystems
- Predict the consequences of drastic changes to the population of individual organisms in an ecosystem

Interdisciplinary Connections

New Jersey Student Learning Standards

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DEPARTMENT: Science COURSE: Science, Grade 7

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SL.II.7.2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

Mathematics:
7.NS.B.3: Solve real-world problems involving four operations with rational numbers.
7.EE.B.3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Career Readiness, Life Literacies, and Key Skills

Concepts:
Medical Application: The interaction of normal flora, abiotic factors, and pathogenic organisms in the human body can have a profound impact on our health.

Crosscutting Concepts:
- Patterns: Patterns can be used to identify cause and effect relationships. (MS-LS2-2)
- Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)
- Energy and Matter: The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)

Skills:
By the end of this unit students will be able to:
- Discuss the levels of organization in nature and differentiate between organisms, populations, communities, and ecosystems
- Differentiate between abiotic and biotic factors
- Describe how ecosystems are affected by both biotic and abiotic factors
- Describe how living things interact with one another.
- Differentiate between producers, primary, secondary, tertiary consumers, and decomposers

DEPARTMENT: Science COURSE: Science, Grade 7

- Differentiate between a food chain and a food web
- Explain the correlation between the size of populations and the availability of energy and matter in different trophic levels
- Explain the importance of decomposers in an ecosystem
- Create a food web that describes the transfer of energy in an ecosystem
- Predict the consequences of drastic changes to the population of individual organisms in an ecosystem

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).

Technology Integration

8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
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Career Education

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**Unit 4-A (5 weeks)**

Topic

Genetics & Medical Technologies

Alignment to Standards

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.

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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 technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Learning Objectives and Activities

Learning Objectives:

- How are DNA structure, genes, chromosomes, and proteins related?
- How do mutations in DNA affect proteins and the overall health and appearance of an organism?
- What are the advantages/disadvantages of sexual and asexual reproduction?
- What current genetic technologies are available and how do they influence human health and medicine?

Learning Activities:

- My Parents Wrecked My Favorite Genes Reading/Questions
- Father of Genetics Notes/Squaring It Up Activity
- Genetics: You're Such a Square
- Phenylthiocarbamide Says What?! Genetics of Taste Lab
- Genetically Superior Hero Project
- Yellow and Blue Make? - Other Inheritance Patterns
- Genetics - A Twisted Tale
- DNA Crime Scene Lab
- DNA - Show Me What You're Made of! INB Activity
- My Fruit is Alive - DNA Extraction Lab
- My DNA Speaks to Me - Protein Synthesis Activity
- Oh Me, Oh Mei-osis notes, Just Like Me and Game of Chance Activities
- Track the Trait - Pedigrees Activity
- Pick Me Hybrid Article Analysis
- Mix it Up - a Hybrid Matching Game
- Get Your Hybrid Here - A Hybrid Sales Campaign
- An Engineered Reading
- Opinion Matters - Genetic Engineering PSA
- Genetics Study Guide/Test

Assessments

Formative:

- Pre-lab Investigation and Review/Practice Questions

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- Describe the contributions of Gregor Mendel in the area of genetics
- Determine how traits are passed from parent to offspring
- Determine the probability of inheriting a trait
- Observational Assessment/Lab Participation

Summative:

- Writing Tasks: Inquiry Lab Reports
- Use amino acids (words) to build proteins (sentences) using various sequences of DNA
- Show understanding of selective breeding by creating a hybrid organism from two genetically similar organisms

Benchmark: N/A

Alternative:

- Journal Entries: “Do Now and Wrap-up” participation
- Identify methods geneticists use to obtain specific traits within organisms
- Research a type of genetic engineering and create a public service announcement from a chosen perspective.

Interdisciplinary Connections

New Jersey Student Learning Standards

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between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
Career Readiness, Life Literacies, and Key Skills
9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a). **9.4.8.CT.1:** Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change,and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). **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.CT.3:** Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. **9.1.5.TL.2** Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
Technology Integration
8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. **8.2.8.ED.3:** Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). **8.2.8.ED.7**: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
Career Education
CRP2. Apply appropriate academic and technical skills. **CRP4.** Communicate clearly and effectively and with reason. **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them. **CRP11.** Use technology to enhance productivity.

Time Frame	**Unit 4-B (4 weeks)**
Topic	
Natural Selection, Adaptations & Evolution	
Alignment to Standards	

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MS-LS4-4: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
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.
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.

Learning Objectives and Activities

Learning Objectives:

- How do genetic variations of traits in a population increase or decrease some individuals' probability of surviving and reproducing in a specific environment?
- How can we use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time?
- What evidence exists to support Darwin's theory of evolution and concept of common descent?

Learning Activities:

- Changes Over Time Differentiated Reading/Questions
- Birdbeak Toothpick Lab
- Mutation Nation and Bird Beak Adaptations Notes/Activity
- Masters of Disguise and Camouflage Chameleons
- Funky Monkeys
- How Old Is That Fossil? Lab
- Evolution of Whales
- HASPI Evolutionary Relationships Reading/Questions
- HASPI Hominid Skull Comparisons Lab
- Gizmo: Human Evolution - Skull Analysis
- HASPI Embryology Lab
- HASPI Evidence of Evolution Reading/Questions
- HASPI Evidence of Evolution Lab
- Building Beasts

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- Gizmos: (1) Natural Selection, (2) Evolution: Mutation & Selection, (3) Evolution: Mutation & Artificial Selection, (4) Rainfall and Bird Beaks (Optional - Additional Reinforcement)

Assessments

Formative:

- Pre-lab Investigation and Review/Practice Questions
- Observational Assessment/Lab Participation
- Demonstrate how species change over time
- Observe how the shape of a bird's beak determines what it eat
- Demonstrate how camouflage can help an organism to survive in its environment

Summative:

- Writing Tasks: Inquiry Lab Reports
- Demonstrate how camouflage can help an organism to survive in its environment
- Demonstrate the process of evolution through natural selection

Benchmark: N/A

Alternative:

- Journal Entries: "Do Now and Wrap-up" participation
- Provide evidence that supports Darwin's theory of evolution and concept of common descent
- Compare and contrast the embryonic development of different species

Interdisciplinary Connections

ELA:
Mathematics:

Career Readiness, Life Literacies, and Key Skills

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problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).

Technology Integration

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Career Education

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CPR-5: Students will have an increased awareness of how human population can affect the environment.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP-12: Students work productively in collaborative groups using culturally global competence.

Time Frame	**Unit 5 (9 weeks)**

Topic

PLTW: Energy in the Environment

Alignment to Standards

Matter and Its Interactions:

- **MS-PS1.3:** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- **MS.PS1.4:** Develop a model that predicts and describes changes in particle motion,temperature, and state of a pure substance when thermal energy is added or removed.

Energy:

- **MS.PS3.1:** Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
- **MS.PS3.3:** Apply scientific principles to design, construct, and test a device that either

minimizes or maximizes thermal energy transfer.*

- **MS.PS3.4:** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
- **MS.PS3.5:** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

Engineering Design:

- **MS.ETS1.1:** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- **MS.ETS1.2:** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- **MS.ETS1.3:** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- **MS.ETS1.4:** Develop a model to generate data for iterative testing and modification of a proposed object,tool, or process such that an optimal design can be achieved.

Earth and Human Activity:

- **MS-ESS3.3:** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- **MS.ESS3.4:** Construct an argument supported by evidence for how increases in human population and per capita consumption of natural resources impact Earth's systems.
- **MS-ESS3.5:** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Learning Objectives and Activities

Learning Objectives:

- What is the difference between renewable and nonrenewable resources?
- How is human resource use impacting the environment and what is the resulting effect on our geosphere, cryosphere, hydrosphere and biosphere?
- What sustainable solutions are available for our energy needs?
- How can we model alternative energy sources and reduce our energy consumption?

Learning Activities:

- PLTW Unit 1: Investigating Energy & Associated Activities
- PLTW Unit 2: Sustainable Energy & Associated Activities

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- PLTW Unit 3: Making an Impact & Associated Activities

Additional Human Impact Activities if Time:

- *STEM the Spill! PBL Project*
- *Hot Stuff! Lab*
- *Ocean Acidification Lab (1.5 Blocks)*
- *Chasing Corals Project*
- *The Penguin Predicament PBL Unit*
- *Renewable Resources K'NEX PBL Project*
- *The Green Energy Debate*
- *Gizmos: Greenhouse Effect, Coral Reefs 1&2, The Carbon Cycle, Energy Conversions*

Assessments

Formative:

- Pre-lab Investigation and Review/Practice Questions
- Describe the differences between, and the advantages and disadvantages of exhaustible, inexhaustible, renewable, and non-renewable energy sources.
- Describe the six main forms of energy; including solar or light radiation, thermal, electrical, mechanical, chemical, and nuclear.
- Differentiate between potential and kinetic energy.
- Observational Assessment/Lab Participation
- Lab Analysis Questions

Summative:

- Writing Tasks: Inquiry Lab Reports
- Identify global energy uses and explain trends toward future demands.
- Demonstrate ways to increase the efficiency of energy used in homes and at school.
- Calculate financial savings and explain effects of our carbon footprint as a result of using energy efficiently.
- Use the design process to design, model, and test a wind turbine for efficiency.

Benchmark: N/A

Alternative:

- Journal Entries: "Do \Now and Wrap-up" participation
- Calculate daily water consumption for a building such as a home or school and recommend water conservation strategies.
- Identify ways that individuals can reduce the effect on the environment through their energy choices and garbage disposal.

- Identify how STEM professionals are involved in integrated waste management and other environmental careers.

Interdisciplinary Connections

New Jersey Student Learning Standards

ELA

RI.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what an informational text says explicitly, as well as inferences drawn from the text.
RI.CI.7.2. Determine a central idea in an informational text and explain how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information.
W.AW.7.1. Write arguments on discipline-specific content (e.g. social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
RI.AA.7.7: Trace and evaluate the argument and specific claims in a text, assessing the reasoning is sound and the evidence is relevant and sufficient to support the claims.
W.SE.7.6: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Mathematics:

7.NS.B.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

Career Readiness, Life Literacies, and Key Skills

Cause and Effect:

- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1)

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-ESS3-1)
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-3)

Investigating Energy (Unit 1):
- Describe the differences between, and the advantages and disadvantages of exhaustible, inexhaustible, renewable, and non-renewable energy sources.
- Describe the six main forms of energy; including solar or light radiation, thermal, electrical, mechanical, chemical, and nuclear.
- Differentiate between potential and kinetic energy.
- Identify global energy uses and explain trends toward future demands.
- Demonstrate ways to increase the efficiency of energy used in homes and at school.
- Calculate financial savings and explain effects of our carbon footprint as a result of using energy efficiently.
- Use the design process to design, model, and test a wind turbine for efficiency.
- Calculate power and work by measuring force, distance, and time using the wind turbine model.
- Describe the roles and responsibilities of STEM professionals for high demand technological careers.

Sustainable Energy (Unit 2):
- Graph data that represents energy consumption, energy imports, and energy production.
- Recognize that alternative energies are not always available in every location.
- Recognize that the solution to our energy needs now and in the future will include conservation and wise use of resources as well as a wide variety of sources.
- Describe the roles and responsibilities of STEM careers that help solve environmental problems.
- Identify alternative forms of energy, explain why they are alternative, and identify the advantages and disadvantages of each.
- Identify challenges in transferring alternative energies from where they are produced to where they are consumed.
- Research an alternative energy solution used for a specific purpose that will reduce the nation's dependence on fossil fuels.

Making an Impact (Unit 3):
- Calculate daily water consumption for a building such as a home or school and recommend water conservation strategies.

- Identify ways that individuals can reduce the effect on the environment through their energy choices and garbage disposal.
- Identify how STEM professionals are involved in integrated waste management and other environmental careers.
- Understand the difference between energy conservation and energy efficiency and be able to calculate both.
- Differentiate between conduction, convection, and radiation as forms of energy transfer.
- Compare the temperature of different materials to determine which are better at preventing heat transfer.
- Design an experiment to investigate the prevention of heat transfer.
- Evaluate a design to reduce heat transfer by weighing the amount of ice remaining; propose improvements for the design.

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

Technology Integration

8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.
8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team
8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

Career Education

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CPR-5: Students will have an increased awareness of how human population can affect the environment.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP-12: Students work productively in collaborative groups using culturally global

competence.

Modifications (ELL, Special Education, At Risk Students, Gifted & Talented, & 504 Plans)

ELL:

- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

Gifted and Talented:

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities

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- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

Supports for Students With 504 Plans:

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns