Unit #2: Life Science- Living Systems

Content Area: **Science**
Course(s): **Grade 5**
Time Period: **Second Marking period**
Length: **12 Week**
Status: **Published**

Unit Overview

This unit has four investigations that focus on systems as the unit of study. The idea of a system is one of the grand integrating (crosscutting) concepts that pervades all of science. Students start by looking at Earth as the interaction of four Earth systems or subsystems-the geosphere, the atmosphere, the hydrosphere, and the biosphere. The focus of the unit then turns to the biosphere as students explore ecosystems and organisms in terms of their interacting parts.

In this unit, students think about systems on different scales-nutrient and transport systems within an organism that move matter and provide energy to the individual organism, and feeding relationships in ecosystems that move matter among plants, animals, decomposers, and the environment. Students come to understand through a variety of experiences that plants get the materials they need for growth primarily from water and air, and that energy in animals' food was once energy from the Sun. There are many opportunities for students to explore how human activities in agriculture, industry, and everyday life can have major effects on these systems. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; scale, proportion, and quantity; system models; and energy and matter.

STAGE 1- DESIRED RESULTS

Educational Standards

2020 New Jersey Student Learning Standards- Science

Performance Expectations

Physical Sciences

SCI.5-PS1	Matter and Its Interactions
SCI.5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.
SCI.5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
SCI.5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.
SCI.5-PS1-3	Make observations and measurements to identify materials based on their properties.
SCI.5-PS1-2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
SCI.5-PS2	Motion and Stability: Forces and Interactions
SCI.5-PS3	Energy
SCI.5-PS3-1	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Life Sciences

SCI.5-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.5-LS1	From Molecules to Organisms: Structures and Processes
SCI.5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.
SCI.5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Earth and Space Sciences

SCI.5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
SCI.5-ESS1-1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
SCI.5-ESS2-2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
SCI.5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
SCI.5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
SCI.5-ESS1	Earth's Place in the Universe
SCI.5-ESS3	Earth and Human Activity
SCI.5-ESS2	Earth's Systems

Engineering Design

SCI.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Science and Engineering Practices

- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Investigations
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

Cross Cutting Concepts

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Functions
- Stability and Change

Disciplinary Core Ideas

Physical Sciences

- PS1. Matter and Its Interaction
- PS1.A: Structure and Properties of Matter
- PS1.B: Chemical Reactions

- PS1.C: Nuclear Processes
- PS2. Motion and Stability: Forces of Interaction
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- PS2.C: Stability and Instability in Physical Systems
- PS3. Energy
- PS3.A: Definitions of Energy
- PS3.B: Conservation of Energy and Energy Transfer
- PS3.C: Relationship Between Energy and Forces
- PS3.D: Energy and Chemical Processes in Everyday Life
- PS4. Waves and Their Applications in Technologies for Information Transfer
- PS4.A: Wave Properties
- PS4.B: Electromagnetic Radiation
- PS4.C: Information Technologies and Instrumentation

Life Sciences

- LS1. From Molecules to Organisms: Structure and Processes
- LS1.A: Structure and function
- LS1.B: Growth and development of organisms
- LS1.C: Growth and development of organisms
- LS1.D: Information Processing
- LS2. Ecosystems: Interactions, Energy, and Dynamics
- LS2.A: Interdependent relationships in ecosystems
- LS2.B: Cycles of matter and energy transfer in ecosystems
- LS2.C: Ecosystem dynamics, functioning, and resilience
- LS2.D: Social interactions and group behavior
- LS3. Heredity: Inheritance and Variation of Traits
- LS3.A: Inheritance of traits
- LS3.B: Variation of traits
- LS4. Biological Evolution: Unity and Diversity
- LS4.A: Evidence of common ancestry and diversity
- LS4.B: Natural selection
- LS4.C: Adaptation
- LS4.D: Biodiversity and humans

Earth and Space Sciences

- ESS1. Earth's Place in the Universe
- ESS1.A: The universe and its stars
- ESS1.B: Earth and the solar system
- ESS1.C: The history of planet Earth
- ESS2. Earth's System
- ESS2.A: Earth materials and systems
- ESS2.B: Plate tectonics and large-scale system interactions
- ESS2.C: The roles of water in Earth's surface processes
- ESS2.D: Weather and climate
- ESS2.E: Biogeology
- ESS3. Earth and Human Activity
- ESS3.A: Natural resources
- ESS3.B: Natural hazards
- ESS3.C: Human impacts on Earth systems
- ESS3.D: Global climate change

Essential Questions

Investigation 1: Systems

Part 1: How can you identify a system?

Part 2: Is planet Earth a system?

Part 3: What organisms are both predators and prey in the kelp forest ecosystem?

Part 4: What happens when compost worms interact with organic litter?

Investigation 2: Nutrient Systems

Part 1: What does yeast need to break its dormancy?

Part 2: How do plants get the food they need?

Part 3: How do animals get the nutrients they need?

Investigation 3: Transport Systems

Part 1: How are nutrients transported to cells in a plant?

Part 2: How do humans transport nutrients to all their cells?

Part 3: How do people breathe?

Investigation 4: Sensory Systems

Part 1: In dodgeball, how are you able to avoid being hit?

Part 2: What features of organisms attract attention?

Part 3: What behaviors are instinctive, and what behaviors are learned?

Part 4: What are the parts of a marine ecosystem?

Enduring Understanding

This life science unit develops students' understanding of how: 1) Organisms live, grow, respond to their environment, and reproduce; 2) And why organisms interact with their environment and what are the effects of these interactions; 3) Energy can be transferred and conserved; 4) And why Earth is constantly changing; and 5) Earth's surface processes and human activities affect each other.

Students will know...

Investigation 1: Systems

aquatic ecosystem, algae, atmosphere, bacteria, biosphere, carnivore, compost, consumer, decomposer, ecosystem, energy, food chain, food web, freshwater ecosystem, geosphere (lithosphere), herbivore, hydrosphere, interact, kelp forest, living, marine ecosystem, microorganism, nonliving, omnivore, phytoplankton, predator, prey, producer, recycle, redworm terrestrial ecosystem, subsystem, system, zooplankton

Investigation 2: Nutrient Systems

bloodstream, by-product, carbon dioxide, cell, chlorophyll, digestion, digestive system, dormancy, esophagus, fungus, large intestine, metabolism, nutrient, photosynthesis, small intestine, stomach, sugar, waste, yeast

Investigation 3: Transport Systems

alveoli, artery, capillary, circulatory system, classify, diaphragm, heart, heart valve, leaf vein, left ventricle, lung, palmate, parallel, phloem, pinnate, respiratory system, right ventricle, sap, transpiration, vascular bundle, vascular system, vein, vital capacity, xylem

Investigation 4: Sensory Systems

adaptation, behavior, brain, central nervous system, inherited trait, instinct, instinctive, learned behavior, neuron, receptor, reflex, response, response time, stimulus

Students will be able to...

Investigation 1: Systems

- Ask questions about what will happen over time to the system called the redworm habitat.
- Develop and use models to understand how energy and matter are transferred among producers, consumers, decomposers, and the environments; identify the limitations of these models.
- Plan and carry out investigations to collect data about the role of redworms in a terrestrial ecosystem.
- Analyze and interpret data about terrestrial and marine food webs, and about model redworm habitat systems; discuss similarities and differences in group findings.
- Construct explanations using evidence about the feeding relationships described by food webs in terrestrial and aquatic ecosystems.
- Engage in argument from evidence about the need for decomposers in ecosystems.
- Obtain, evaluate, and communicate information from books and media and integrate that with firsthand experiences to construct explanations about flow of matter and energy in ecosystems through feed webs.

Investigation 2: Nutrient Systems

- Develop and use models to understand how food is produced by plants through the process of photosynthesis and how animals change food into nutrients through the process of digestion so the nutrients can be transported to all the cells of the body.
- Plan and carry out investigations dealing with yeast metabolism of sugar, and plant producing of sugar through photosynthesis.
- Analyze and interpret data to make sense of the process of photosynthesis in plants and digestion in humans.
- Use mathematics and computational thinking to conduct and analyze experiments of yeast metabolism; compare quantitative data produced by different experimental groups.
- Construct explanations using evidence to explain how a fungus such as yeast, a plant such as wheat, or animals, such as a butterfly or humans, get nutrients to support for life functions.
- Engage in argument from evidence to develop models to explain phenomena and to critique the models put forth by others.

Investigation 3: Transport Systems

- Ask questions about the human respiration system that could be answered by measuring lung volume.
- Develop and use models to understand systems used to transport nutrients, gases, and water in plants and animals (humans).
- Plan and carry out investigations dealing with transpiration in plants and vital lung capacity in humans.
- Analyze and interpret data to make sense of phenomena dealing with water and nutrient flow in plants and lung vital capacity in humans.
- Use mathematics and computational thinking to measure human lung vital capacity.

- Construct explanations using evidence to explain transport systems in plants (vascular systems) and circulatory and respiratory systems in humans.
- Obtain, evaluate, and communicate information from books and media and integrate that with their firsthand experiences to construct explanations of transport systems in plants and humans.

Investigation 4: Sensory Systems

- Ask questions about the functions of the human nervous system.
- Plan and carry out investigations to understand how stimulus-response actions are involved in the human sensory system and how animals use visual attraction to communicate.
- Analyze and interpret data to make sense of phenomena of stimulus-response to understand reaction time in humans.
- Use mathematics and computational thinking to analyze data from reaction time investigations comparing right hand to left hand, and feet to hands.
- Construct explanations using evidence to explain how the human sensory receptors provide information from the environment, send it to the brain, where it is interpreted to produce a return message sent to muscles to take action.
- Obtain, evaluate, and communicate information from books and media and integrate that with their firsthand experiences to construct explanations of sensory systems in humans and other animals; find out about the importance of the marine ecosystem to the Earth system.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment Suggestions

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation

- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments Suggestions

Investigation 1: Systems

- Science notebook entries
- Response sheet
- Performance assessment
- Survey
- Investigation 1 I-Check

Investigation 2: Nutrient Systems

- Science notebook entries
- Response sheet
- Investigation 2 I-Check

Investigation 3: Transport Systems

- Science notebook entries
- Response sheet
- Performance assessment
- Investigation 3 I-Check

Investigation 4: Sensory Systems

- Science notebook entries
- Response sheet

Benchmark Assessments

Unit Posttest

STAGE 3- LEARNING PLAN

Instructional Map

Investigation 1: Systems

Investigation 2: Nutrient Systems

Investigation 3: Transport Systems

Investigation 4: Sensory Systems

Investigation 1: Systems

Investigation 1: Part 1- Everyday Systems

Students are introduced to a system as a collection of interacting parts that work together to make a whole or produce an action. They are presented with a common device and identify all the elements that go together to make that system. Students describe other systems and subsystems.

Content:

- A system is a collection of interacting objects, ideas, and/or procedures that together define a physical entity or process.
- A subsystem is a small system that is inside a larger system.

Investigation 1: Part 2- The Earth System

Students explore Earth as a system. Through video, they are introduced to four subsystems of planet Earth- the geosphere, atmosphere, hydrosphere, and biosphere. Students focus on the biosphere and describe ecosystems by looking at feeding relationships and energy transfers, described as food webs.

Content:

- Earth can be described as the interaction of four earth systems: the rocky part (the geosphere), the atmosphere, the water (the hydrosphere), and the complexity of living organisms (the biosphere).
- Food webs are subsystems within ecosystems. They describe the transfer of matter and energy within the system.

Investigation 1: Part 3- Kelp Forest Food Web

Students work with organism cards to create food webs in a kelp forest. They are introduced to a marine ecosystem and investigate food webs in the system.

Content:

- A kelp forest has similarities to a rain forest (vertical layering).
- Phytoplankton are the major producers in most aquatic systems.
- Food webs and competition for resources exist in marine systems.

Investigation 1: Part 4- Recycling

Each group of students sets up a redworm habitat system to study detritivores. They record what organic materials go into the habitat with about 15 redworms and observe changes in the worm jar over 1-2 months.

Content:

- Food webs are made up of producers (organisms that make their own food), consumers (organisms that eat other organisms to obtain food), and decomposers (organisms that consume and recycle dead organisms and organic waste).

Investigation 2: Nutrient Systems

Investigation 2: Part 1- Yeast Nutrition

Students design an investigation to determine the necessary conditions for activating dry yeast. After determining that water and a cookie produce yeast activity, they conduct experiments to discover that it is the sugar in the cookie that activates the yeast. Yeast is introduced as a single-celled fungus.

Content:

- Yeast is a single-celled fungus.
- Dormant yeast cells can become active when provided with water, warmth, and sugar as a food source.
- Carbon dioxide is a waste by-product of yeast metabolism.
- A nutrient is a substance, such as sugar or starch, that is used by a cell to produce the energy needed to perform the functions of life.

Investigation 2: Part 2- Plant Nutrition

Students think about how to break the dormancy of another organism, the wheat plant. They plant wheat seeds in containers of soil and place half of the planters in a lighted environment and the other half in a dark environment. Students read about the action of chlorophyll and its role in the manufacture of sugar. They observe their wheat plants to determine which plants have chlorophyll. Students infer that the plants growing in light are the ones prepared to produce food to provide nutrients to their cells.

Content:

- Plants make their own food by photosynthesis.
- Chlorophyll is the green pigment that absorbs sunlight in the cells of producer organisms.
- Green plant cells make sugar (food) from carbon dioxide and water in the presence of sunlight, and release oxygen.

Investigation 2: Part 3 -Animal Nutrition

Students investigate how animals acquire nutrients for their cells by eating and digesting food. The painted lady butterfly goes through its life cycle while students observe the larvae and adults eating different food sources. The human digestive system is explored through a video that shows an experiment on chemical digestion in the stomach.

Content:

- Animals obtain nutrients by eating other organisms.
- Digestion is the process used by animals to break down complex food items into simple nutrients.

Investigation 3: Transport Systems

Investigation 3: Part 1- Plant Vascular Systems

Students continue their exploration of plants by observing the veins in leaves. They plant wheat seeds in clear straws to allow detailed observation of the development of leaves and to investigate their functions. Students go outdoors to discover what happens when some foliage of a growing plant is constrained in a clear plastic bag. When moisture condenses inside the bag, students speculate about the source of the water they find.

Content:

- Scientists classify objects and information by organizing them into groups with similar attributes.
- Vascular bundles are arranged in predictable patterns of veins in the leaves of vascular plants.
- Vascular plants have specialized tissues for the transport of water, minerals, and sugar to cells: xylem tubes carry water and minerals from the plant's roots to all the cells in a one-way flow; phloem tubes carry sugar from the leaves to all the cells that need it.

Investigation 3: Part 2- Circulatory Systems

Students see a video showing how blood is delivered to every human cell by a system of vessels connected to a pump, the heart. They read about the structures inside the human heart. Students use simple equipment to assemble a functional model of a circulatory system that can pump blood to the lungs, collect blood from the lungs, and pump it to the body, where it is recycled.

Content:

- All cells have basic needs: water, food, gas exchange, and waste disposal. Multicellular organisms have systems for transporting nutrients and wastes.
- In the human circulatory system, blood transports resources to the cells and wastes from the cells.

Investigation 3: Part 3- Respiratory Systems

Students study the structures and functions of the interacting parts of the respiratory system, learning about the acquisition and distribution of oxygen, and the process of waste removal. They measure their lung volume (vital capacity) and read about the circulatory and respiratory systems of other animals.

Content:

- In humans, the respiratory system transports oxygen to the blood and carbon dioxide from the blood.
- All cells have basic needs: water, food, gas exchange, and waste disposal. Multicellular organisms have systems for transporting nutrients and wastes.

Investigation 4: Sensory Systems

Investigation 4: Part 1- Stimulus/Response

Through video and text, students learn about the role of sensory and motor neurons in brain messages. They use a falling cup to investigate the time that elapses between a visual stimulus and a response. They compare foot-response time to hand-response time.

Content:

- A stimulus is something that triggers (starts) a response. A stimulus is often information received through the senses.
- A response is a reaction of a living thing to a stimulus.
- Response time is the length of time it takes for a person to respond to a stimulus.

Investigation 4: Part 2- Attention

Each student chooses attention-getting colors, patterns, and a habitat for an action card. The cards are distributed to other students, who create organisms outdoors to attract the attention of the student who completed the card.

Content:

- Animal adaptations include pattern and color that attract attention to warn predators off or to attract a mate.
- Animals communicate to warn others of danger, scare predators away, or locate others of their kind, including family members.

Investigation 4: Part 3- Instinct and Learning

Students learn about instinctive and learned behaviors. They study the monarch butterflies and their instinctive migration over several generations.

Content:

- Instinctive behaviors, such as knowing what to eat, how to find shelter, and how to migrate, help organisms survive.
- Some animals learn behaviors by watching adults or through trial and error.

Investigation 4: Part 4- Ecosystems

Students bring their study of decomposers to an end by dismantling the worm-habitat system they started 2 months earlier. They study marine ecosystems and are introduced to the importance of the ocean in the carbon cycle.

Content:

- Marine ecosystems have biotic (living) and abiotic (nonliving) parts.
- Phytoplankton are the base of the food chain in the ocean.

The ocean plays an important role in the carbon cycle.

Modifications/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion

- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary

- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook

- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct
- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

High Preparation Differentiation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Menu Assignments
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation Differentiation

- Choice of Book / Activity
- Cubing Activities

- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

New Jersey Student Learning Standards for Mathematics

N-Q.A.Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; chose and interpret the scale and the origin in graphs and data displays
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose the level of accuracy appropriate to limitations on measurement when reporting quantities.

N-CN.A. Perform arithmetic operations with complex numbers.

1. Know there is a complex number.
2. Use the commutative, associative, and distributive properties.

A-SSE.A. Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.

A-SSE.B. Write expressions in equivalent forms to solve problems.

1. Choose and produce an equivalent form of an expression to reveal and explain properties of the

quantity represented by the expression.

F-IF.A. Understand the concept of a function and use functional notation.

1. Understand that a function from one set to another set.

F-IF.B Interpret functions that arise in applications in terms of the context.

F-IF.C. Analyze functions using different representations

S-ID.A. Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on a real number line.

S-ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables.

S-ID.C. Interpret linear models.

S-IC.A. Understand and evaluate random processes underlying statistical experiments.

S-IC.B. Make inferences and justify conclusions from surveys, experiments, and observational studies.

English Language Arts Standards – Grade 5

RF 4: Read text with purpose and understanding.

RI 1: Ask and answer questions about key details.

RI 2: Identify main topic and retell key details.

RI 3: Describe the connection between two ideas.

RI 4: Ask and answer questions about unknown words.

RI 5: Identify the front cover, back cover, and title page of a book.

RI 6: Distinguish their own point of view from that of the author of the text.

RI 7: Describe the relationship between illustrations and the text.

RI 8: Identify the reasons an author gives to support points.

RI 9: Identify similarities in and differences between text on the same topic.

RI 10: Actively engage in group reading activities with purpose and understanding.

W 2: Write informative /explanatory text.

W 4: Produce clear and coherent writing.

W 5: Strengthen writing by revising and editing.

W 7: Conduct short research projects.

W 8: Gather information to answer a question.

W 9: Draw evidence from informational text to support reflection.

2020 New Jersey Student Learning Standards- Computer Science and Design Thinking

Computer Science and Design Thinking Practices

CSDT.K-12.CSDTP1	Fostering an Inclusive Computing and Design Culture
CSDT.K-12.CSDTP2	Collaborating Around Computing and Design
CSDT.K-12.CSDTP3	Recognizing and Defining Computational Problems
CSDT.K-12.CSDTP4	Developing and Using Abstractions
CSDT.K-12.CSDTP5	Creating Computational Artifacts
CSDT.K-12.CSDTP6	Testing and Refining Computational Artifacts
CSDT.K-12.CSDTP7	Communicating About Computing and Design

8.2 Design Thinking

8.2.5.ED.1: Explain the functions of a system and its subsystems. 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints). 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process. 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system. 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. 8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career.
8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem. 8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies. 8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team. 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies.
8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. 8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources. 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved. 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment. 8.2.5.ETW.5: Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.
8.2.5.EC.1: Analyze how technology has contributed to or reduced inequities in local and global communities and determine its short- and long-term effects.

2020 New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills

Career Readiness, Life Literacies, and Key Skills Practices

CRP.K-12.CRP1	Act as responsible and contributing community members and employee.
CRP.K-12.CRP2	Attend to financial well-being.
CRP.K-12.CRP3	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Demonstrate creativity and innovation.
CRP.K-12.CRP5	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP6	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP7	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP8	Use technology to enhance productivity, increase collaboration and communicate effectively.
CRP.K-12.CRP9	Work productively in teams while using cultural/global competence.

9.2 Career Awareness and Planning

9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes. 9.2.5.CAP.2: Identify how you might like to earn an income. 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations. 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

9.4 Life Literacies and Key Skills

9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6). 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7). 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a). 9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).
9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2). 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1). 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems. 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).
9.4.5.DC.1: Explain the need for and use of copyrights. 9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media. 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions. 9.4.5.DC.4: Model safe, legal, and ethical behavior when using online or offline technology (e.g., 8.1.5.NI.2). 9.4.5.DC.5: Identify the characteristics of a positive and negative online identity and the lasting implications of online activity. 9.4.5.DC.6: Compare and contrast how digital tools have changed social interactions (e.g., 8.1.5.IC.1). 9.4.5.DC.7: Explain how posting and commenting in social spaces can have positive or negative consequences. 9.4.5.DC.8: Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).
9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., *Social Studies Practice* - Gathering and Evaluating Sources). 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3). 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data. 9.4.5.IML.4: Determine the impact of implicit and explicit media messages on individuals, groups, and society as a whole. 9.4.5.IML.5: Distinguish how media are used by individuals, groups, and organizations for varying purposes. (e.g.,

1.3A.5.R1a). 9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5). 9.4.5.IML.7: Evaluate the degree to which information meets a need including social emotional learning, academic, and social (e.g., 2.2.5. PF.5).
9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each. 9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings. 9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols. 9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a). 9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

Vertical Integration- Discipline Mapping

LS1- Kindergarten: Trees and Weather; Animals Two by Two

Grade 1: Plants and Animals

Grade 2: Insects and Plants

Grade 3: Structures of Life

Grade 4: Environments

Grade 6: Diversity of Life

Grade 7: Populations and Ecosystems

Grade 8: Human Systems Interactions

LS2- Grade 2: Insects and Plants

Grade 3: Structures of Life

Grade 7: Populations and Ecosystems

PS3- Kindergarten: Materials and Motion; Trees and Weather

Grade 4: Energy

Grade 7: Electromagnetic Force, Gravitational, and Kinetic Forces

ESS2- Kindergarten: Trees and Weather

Grade 2: Pebbles, Sand, and Silt

Grade 3: Water and Climate

Grade 4: Soils, Rocks, and Landforms

Grade 7: Planetary Science

Grade 8: Earth's History

ESS3- Kindergarten: Trees and Weather; Animals Two By Two

Grade 3: Water and Climate

Grade 4: Environments

Grade 8: Earth's History

Additional Materials

Visit Fossweb.com for list of websites and additional readings.