BOE Approved 8/18

Cliffside Park Public Schools

Science

Unit Name: Living Systems (Life Science)

Resource: FOSS Next Generation, Delta Education

Duration: Ten Weeks

Enduring Understanding

Systems

- A system is a collection of interacting objects, ideas, and/or procedures that together define a physical entity or process.
- Earth can be described as the interactions 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 systems.
- 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).

Nutrient Systems

- Chlorophyll is the green pigment that absorbs sunlight in the cells of producer organisms.
- Green plant cells make sugar (nutrients) from carbon dioxide and water in the presence of sunlight, and release oxygen.
- 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.
- Plants make their own food by photosynthesis. Animals obtain nutrients by eating other organisms.
- Digestion is the process used by animals to break down complex food items into simple nutrients.

Transport Systems

- All cells have basic needs: water, food, gas exchange, and waste disposal. Multicellular organisms have systems for transporting nutrients and waste.
- Vascular plants have specialized tissues for the transport of water, minerals, and sugar to cells.
- In the human circulatory system, blood transports resources to the cells and wastes from the cells.
- In humans, the respiratory system transports oxygen to the blood and carbon dioxide from the blood.

Sensory Systems

- 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.
- 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.

Essential Questions

Systems

- How can you identify a system?
- Is planet Earth a system?
- What organisms are both predators and prey in the kelp forest ecosystem?
- What happens when compost worms interact with organic litter?

Nutrient Systems

- What does yeast need to break its dormancy?
- How do plants get the food they need?
- How do animals get the nutrients they need?

Transport Systems

- How are nutrients transported to cells in a plant?
- How do humans transport nutrients to all their cells?
- Why do people breathe?

Sensory Systems

- In dodgeball, how are you able to avoid being hit?
- What features of organisms attract attention?
- What behaviors are instinctive, and what behaviors are learned?

- What are the parts of a marine ecosystem?

Focus of Standards

Student Outcomes	**Skills**	**Assessments**
Systems ● I can identify that a system is a collection of interacting objects, ideas, and/or procedures. ● I can describe the four earth systems ● I can recognize that food webs are subsystems within ecosystems and can describe the transfer of matter and energy within the system. ● I can identify that food webs are made up of producers, consumers, and decomposers. **Nutrient Systems** ● I can identify that chlorophyll is the green pigment that absorbs sunlight in the cells of producer organisms. ● I can explain that green plant cells make sugar (nutrients) from carbon dioxide and water in the presence of sunlight, and release oxygen. ● I can identify that 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. ● I can explain that plants make their own food by photosynthesis and that animals get nutrients by eating other organisms. ● I can describe that digestion is the process used by animals to break down complex food items into simple nutrients.	● Asking Questions and Defining Problems ● Developing and Using Models ● Classifying Information ● Observing Investigations ● Exploring New Ideas ● Planning and Carrying Out Investigations ● Analyzing and Interpreting Data ● Using Mathematics and Computational Thinking ● Constructing Explanations and Designing Solutions ● Engaging in Argument from Evidence ● Obtaining, Evaluating and Communicating Information	***Assessments:*** ● **Formative**: Notebook Entries: ○ Notebook Entries ○ Identify that a system is a collection of interacting objects, ideas, and/or procedures ○ Explain that green plant cells make sugar (nutrients) from carbon dioxide and water in the presence of sunlight, and release oxygen. ○ Teacher Observation ○ Anecdotal Records/Notes ○ Science notebook ○ Embedded Assessment Notes ● **Summative Performance** ○ Foss Post-test on Living Systems ○ Vocabulary check ● **Benchmark Assessments**: ○ Investigation Checks ○ Constructing systems ○ Constructing photosynthesis-cellular respiration ○ Constructing models- Senses ○ Diagramming- movement through photosynthesis/respiration ○ Applying- biotic/abiotic environments/systems ● **Alternative:** ○ Conferences ○ Diagrams ○ Word Bank for vocabulary

Transport Systems ● I can list the basic needs of cells: water, food, gas exchange, and waste disposal. ● I can explain the process for transport of water, minerals, and sugar to cells in vascular plants. ● I can define that the human circulatory system uses blood to transport resources to the cells and waste from the cells. ● I can define that the respiratory system transports oxygen to the blood and carbon dioxide from the blood. **Sensory Systems** ● I can define that a response is a reaction of a living thing to a stimulus. ● I can state that response time is the length of time it takes for a person to respond to a stimulus. ● I can describe that animal adaptations include pattern and color that attract attention to warn predators off or to attract a mate. ● I can express that animals communicate to warn others of danger, scare predators away, or locate others of their kind, including family members. ● I can list instinctive behaviors, such as knowing what to eat, how to find shelter, and how to migrate, help organisms survive. ● I can identify that marine ecosystems have biotic (living) and abiotic (nonliving) parts.		○ Modeling ○ Illustrations of systems- human body/environmental ○ Storybook assembly- path of water through photosynthesis/respiration

NJ Student Learning Standards: Science
Energy
5-PS3-1. Use models to describe that that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
From Molecules to Organisms: Structures and Processes
5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.
Ecosystems: Interactions, Energy, and Dynamics
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Earth's Systems
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
Earth and Human Activity
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

ELA: RI.5.1, RI.5.3, RI.5.4, RI.5.5, RI.5.6, RI.5.8, RI.5.9
Math: 5.OA.A.1, 5.OA.A.2, 5.OA.A.3, 5.MD.A.1, 5.MD.B.2, 5.MD.C.3, 5.MD.C.4, 5.MD.C.5

NJSLS: 21st Century Life and Careers
Career Awareness, Exploration, And Preparation
Strand B: Career Exploration
9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, homework, and extracurricular activities for use in a career.
9.2.8.B.4 Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.

Career Ready Practices.
CRP 4. Communicate clearly and effectively and with reason.
CRP 5. Consider the environmental, social and economic impacts of decisions.
CRP 6. Demonstrate creativity and innovation.
CRP 7. Employ valid and reliable research strategies.
CRP 8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP 9. Model integrity, ethical leadership and effective management.
CRP 11. Use technology to enhance productivity.

NJSLS: Technology
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

8.1.5.A.2 Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.
8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.
D. Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
8.1.5.D.1 Understand the need for and use of copyrights.
8.1.5.D.4 Understand digital citizenship and demonstrate an understanding of the personal consequences of inappropriate use of technology and social media.
E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.
F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
8.1.5.F.1 Apply digital tools to collect, organize, and analyze data that support a scientific finding.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.
B. Technology and Society: Knowledge and understanding of human, cultural and societal values are fundamental when designing technology systems and products in the global society.
8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life cycle**.**
C. Design: The design process is a systematic approach to solving problems.
8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.
8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
8.2.5.C.5 Explain the functions of a system and subsystems.
D. Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
8.2.5.D.6 Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.
E. Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
8.2.5.E.1 Identify how computer programming impacts our everyday lives.

NJSLS: Science and Engineering Practices

Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions about what would happen if a variable is changed.
- Identify scientific (testable) and non-scientific (non-testable) questions.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- Use prior knowledge to describe problems that can be solved.
- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Practice 2. Developing and using models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Identify limitations of models.
- Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
- Develop and/or use models to describe and/or predict phenomena.
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
- Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.

Practice 3. Planning and carrying out investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- Evaluate appropriate methods and/or tools for collecting data.
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

Practice 4. Analyzing and interpreting data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
- Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
- Analyze data to refine a problem statement or the design of a proposed object, tool, or process.
- Use data to evaluate and refine design solutions.

Practice 5. Using mathematics and computational thinking
Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to

a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.
- Organize simple data sets to reveal patterns that suggest relationships.
- Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.
- Create and/or use graphs and/or charts generated from simple algorithms to compare alternative solutions to an engineering problem.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard).
- Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.
- Apply scientific ideas to solve design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Compare and refine arguments based on an evaluation of the evidence presented.
- Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.
- Respectfully provide and receive criticism from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
- Construct and/or support an argument with evidence, data, and/or a model.
- Use data to evaluate claims about cause and effect.
- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

- Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.
- Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.
- Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.

Core Instructional Materials:

- FOSS Next Generation: Living Systems(2016)

Supplemental Materials: (videos, leveled readers, Readworks, recommended books etc.)
Videos: https://www.fossweb.com/moduledetail?dDocName=G3842595&classId=
Recommended books: https://www.fossweb.com/additional-resources-books-xslt?dDocName=G4292315#non-fiction-books

21st Century Themes

- Global Awareness
- Civic Literacy
- Health Literacy
- Environmental Literacy
- Financial/Economic/Business/Entrepreneurial Literacy

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 animal's 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; cause and effect; proportion, and quantity; systems and systems models; and energy and matter.

21st Century Skills

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

Interdisciplinary Connections
ELA

- Read and comprehend complex science texts related to their prior experience and knowledge.
- Write informational/explanatory texts, arguments to support claims, and narratives about experience in science.
- Engage in collaborative discussions about science.
- Learn new vocabulary and language structures in context.

Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.

- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Differentiation/Accommodations/Modifications ***(Alternate Modes of Instruction and Support)***		
Modifications to Support Gifted and Talented Students	**Modifications to Support English Language Learners**	**Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)**
Newsela article: *Blood and the classification of blood vessels* Lexile: 930 Recommended non fiction books https://www.fossweb.com/additional-resources-books-xslt?dDocName=G4292315#non-fiction-books Independent research- where does water go? In photosynthesis Cooperative hierarchy- cells to organisms Debate / Compare and contrast- human organ systems - how do they interconnect.	Newsela article: *Blood and the classification of blood vessels* (Spanish version) Equipment photo cards (spanish and english) Modeling human systems - diagram and label- in native language Visual cues- image gallery https://www.fossweb.com/additional-resources-image-galleries-xslt?dDocName=G4292315#image-galleries Researching Solutions we drink Vocabulary log- Pronunciation/translation assistance https://dictionary.cambridge.org/us/	Newsela article: *Blood and the classification of blood vessels* Lexile: 630 Storyboard-path of blood in the human body Equipment photo cards Visual cues- image gallery https://www.fossweb.com/additional-resources-image-galleries-xslt?dDocName=G4292315#image-galleries Word walls Review student individual educational plan and/or 504 plan. Establish procedures for accommodations and modifications for assessments as per IEP/504. Establish procedures for modification of classwork and homework as per IEP/504.

Participate in inquiry and project-based learning units of study Assigning roles within partnerships Differentiated supports: content, process, product, environment	Vocabulary builder Thesaurus- https://www.thesaurus.com/ Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) Pair visual prompts with verbal presentations Front Load and immerse students in literacy and language experiences related to content Provide students with visual models, sentence stems, concrete objects, and hands-on materials. Model procedures for life skills. Collaboration between ELL and general education teacher to maximize learning	Modify classroom environment to support academic and physical needs of the students as per IEP/504. Provide appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team. Differentiation through content, process, product, environment Provide Title I services to students not meeting academic standards in ELA and/or Math. Provide instructional adaptations and interventions in the general education classroom. Modify classroom environment to support student needs. Differentiated instruction Basic Skills Intensive individual intervention

Sources:
NJSLS Science Standards (2016): http://www.nj.gov/education/cccs/2016/science/
NJ: 2014 SLS: Technology: http://www.state.nj.us/education/cccs/2014/tech/8.pdf
NJSLS-S: Science and Engineering Practices: http://www.nj.gov/education/cccs/2016/science/3-5-ETS1.pdf
21st Century Life and Careers: http://www.state.nj.us/education/cccs/2014/career/9.pdf
Career Ready Practices: http://www.state.nj.us/education/cccs/2014/career/9.pdf
2015 FOSS Next Generation: www.FOSSweb.com
NSTA: https://ngss.nsta.org/