Unit 3 Structures and Functions of Living Things

Content Area: **Science**
Course(s):
Time Period: **Trimester 3**
Length: **10-12 weeks**
Status: **Published**

Summary

Introduction:

In this unit of study, students develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Students will also explore how living things receive information through their senses. Students will gain an understanding that different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.T
he crosscutting concepts of systems and system models are called out as organizing concepts for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in engaging in argument from evidence. Students are also expected to use this practice to demonstrate understanding of the core idea.

This unit is based on 4-LS1-1 and 4-LS1-2, 3-5-ETS1-1, 3-5-ETS1-2, and 3-5-ETS1-3

This unit will be taught utilizing the required resource in Life Science : Environments FOSS program kit.

Revision Date July 2021

CS.3-5.8.1.5.DA.3	Organize and present collected data visually to communicate insights gained from different views of the data.
CS.3-5.8.1.5.DA.4	Organize and present climate change data visually to highlight relationships or support a claim.
CS.3-5.8.2.5.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.
CS.3-5.8.2.5.ED.3	Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
CS.3-5.8.2.5.ITH.2	Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have.
LA.W.4.2.B	Develop the topic with facts, definitions, concrete details, text evidence, or other information and examples related to the topic.
LA.W.4.7	Conduct short research projects that build knowledge through investigation of different aspects of a topic.
LA.RF.4.3	Know and apply grade-level phonics and word analysis skills in decoding and encoding words.
LA.RI.4.3	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
LA.RI.4.7	Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
LA.SL.4.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and

	teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.4.4	Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
LA.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.
MA.4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table.
MA.4.MD.A.2	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
MA.4.MD.B	Represent and interpret data.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
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-ETS1-2	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.

SCI.4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
SCI.4-LS1-2	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.
TECH.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).
TECH.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).
	Constructing Explanations and Designing Solutions
	A variety of control structures are used to change the flow of program execution (e.g., sequences, events, loops, conditionals).
	Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.
	Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
	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).
	A system can be described in terms of its components and their interactions.
	Planning and Carrying Out Investigations

Essential Questions/ Enduring Understandings

Essential Questions:

How are animals and plants similar and different?

How do internal and external parts of animals help them to survive, grow, behave, ad reproduce?

How do similar structures compare across different living things?

How do animals receive and process different types of information from their environments in order to respond appropriately?

In what ways does nature influence scientific design?

Enduring Understandings:

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain.

Animals are able to use their perceptions and memories to guide their actions.

Objectives

Students will know that animals have internal and external structures that support their growth, reproduction, and survival.

Students know that plants have internal and external structures that support their growth, reproduction, and survival.

Students will know that animals receive information through their senses.

Students know that animals use information received through their senses to respond to different stimuli.

Students will be skilled at...

- Asking questions and defining problems
- Developing and using models
- 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

Learning Plan

*You can begin this unit by giving students examples of internal and external structures of living things (see Materials section for visual about animal structures).

*Consider completing the "Comparing Structures Across Species" research project.

FOSS Investigation 1: Environmental Factors

Part 1: Observing Mealworms

Students observe mealworms and describe their structures and behaviors. They ask questions to determine what they need to do to provide a proper environment for the mealworms to thrive. Each group sets up a mealworm environment and keeps it at room temperature. The class keeps additional mealworm environments at colder temperatures. At the end of this lesson, students should know that organisms have structures that allow them to survive in their environment. Students should be able to explain some of the external structures of the mealworm and how it helps it to meet its needs.

To assess, you can use student mealworm observation entries.

Part 2: Designing an Isopod Environment:

The class conducts two different investigations to find out how isopods respond to the environmental factors of water and light. Based on their findings, students design an isopod environment in a terrarium. The focus of this lesson is that the isopods are receiving information from their environment through their senses and using that information to make decisions for survival.

To assess, you can

- use student mealworm observation entries and the "Response Sheet- Investigation 1" notebook entry. (No. 5- Notebook Master)

- Investigation 1 i-Check

Investigation 2: Ecosystems

Part 2: Food Chains and Food Webs

Students work with ecosystem cards to create food chains and food webs in a woodland ecosystem that includes terrestrial and aquatic environments. Students learn that by using the Sun's energy, plants and algae are the primary source of matter and energy entering moist food chains and food webs. Students are introduced to the terms for different functional roles that organisms play in food chains. It would be good to touch on the different structures that each animal has to find food. For example, herbivores usually have flatter teeth for grinding up plants while carnivores have sharp teeth for tearing meet. Also, animals who are typically prey for larger carnivores have larger spaced eyes and ears for protection.

In this investigation, it is also important to focus on the specific structures each organism has to help it find and eat food.

Gizmos that support this lesson:

Prairie Ecosystem: Observe the populations of grass, prairie dogs, ferrets and foxes in a prairie ecosystem. Investigate feeding relationships and determine the food chain.

Forest Ecosystem: Observe and manipulate the populations of four creatures (trees, deer, bears, and mushrooms) in a forest. Investigate the feeding relationships (food web) in the forest. Determine which creatures are producers, consumers, and decomposers.

Part 3: Population Stimulation

Students go to the schoolyard to stimulate a population of deer foraging for food in its home range. Students are introduced to the concept of carrying capacity, the greatest number of organisms that can be supported (carried) by an area without damaging it. Students should gain an understanding of how adn why organisms interact with their environment and what the effects of those interactions are. In addition, this lesson supports the concept of information processing, how organisms live, grow, and respond to their environment.

Part 4: Sound Off

Students go to the school yard and pretend to be animals who have poor vision or are active at night. The animals communicate with one unique sound and try to find others of their kind before being captured by a predator. After three rounds of this activity, students sit silently and listen to animals in the schoolyard.

** In this investigation you can also discuss structures that animals have to protect themselves from predators

as well as how animals receive information through their senses**

To assess, you can

- use the “Response Sheet- Investigation 2” notebook entry (No. 13- Notebook Master)
- Investigation 2 iCheck

Gizmos that support this lesson

Senses: Everything we know about the world comes through our senses: sight, hearing, touch, taste, and smell. In the Senses Gizmo, explore how stimuli are detected by specialized cells, transmitted through nerves, and processed in the brain.

Brainpop videos that support this lesson (search “senses”)

Each of these focus on how we receive and process information through our senses. The quizzes can be used as assessments.

- Smell
- Touch
- Taste

Investigation 3: Brine Shrimp Hatching (This entire investigation is optional)

Investigation 4: Range of Tolerance

Part 1: Water or Salt Tolerance and Plants

Half of the class sets up an experiment to determine the range of water tolerance for the early growth of four different plants. The other half of the class sets up a controlled experiment to test the effect of salinity on the same four plants. Students should understandthat organisms have specific requirements for growth, development, and reproduction. There is a relationship between environmental factors and how well an organism can grow.

To assess, you can

- use the “Response Sheet- Investigation 4” notebook entry (No. 25- Notebook Master)

Gizmos that support this investigation:

Germination: Plant seeds and watch how many sprout. Examine what factors affect germination. Vary the amount of heat, water, and light the seeds get. Practice designing controlled experiments and using the scientific method.

Effect of Environment on New Life Form Using the scientific method, control the environmental conditions for a fictional alien organism in order to learn how the organism responds to changes in conditions

Flower Pollination- (the focus here cna be on plant structures for reproduction) Observe the steps of pollination and fertilization in flowering plants. Help with many parts of the process by dragging pollen grains to the stigma, dragging sperm to the ovules, and removing petals as the fruit begins to grow. Quiz yourself when you are done by dragging vocabulary words to the correct plant structure.

Supplemental activities can be found in the "Materials" section. They include the following

- "Monster Plants"- students learn about the different structures of carnivorous plants. Then they use what they have learned to create their own carnivorous plant.

- "Biomimicry Engineering Design Challenge"- Students learn about how nature has influenced many technologies we use today. Students will then use inspiration from nature to help create something to help someone survive in the Atacama Desert.

- "Animal Adaptations" Project- Students choose a fictional environment. They learn about the climate, natural resources, etc. of that environment and design an imaginary animal with specific structures to help them survive in that environment.

Assessment

Formative: teacher observation, student responses during lessons, exit tickets, science notebook questions/observations

Summative: investigation response sheets, science notebooks, quizzes, Survey/Posttest Questions

Benchmark: iChecks, Science Notebooks

Alternative: oral presentation with visual model such as a Google slideshow to demonstrate understanding of concepts, drawing models, FOSS extensions

Materials

Core Book List

FOSS Kit Unit 3- Environments

Discovery Education/BrainPOP

Science notebook for assessment and journaling

Gizmos (grades 3-5) See learning plan for which Gizmo supports each investigation/concept

Animal Structures Visual

Comparing Structures across Species

Bimimicry Engineering Design Challenge:

Bimimicry Video Part 1

Biomimicry Video Part 2

Biominucry Design Planning Sheet

Patent Template

Plant Structures: Monster Plants Project

Brain Pop

Monster Plants: Part 1

Monster Plants: Part 2

Monster Plants: Part 3