Animals and Their Senses

Grade: 4
Subject: Science (STEAM approach)
Unit Focus:
Students explore how their senses work, including experiments with light and sound, connecting this learning to waves and information processing.

Key Understandings & Standards

- **Structure & Function:** Plants and animals have internal and external structures that support survival, growth, behavior, and reproduction (LS1.4.A1).
- **Senses & Information Processing:** Different sense receptors detect specific types of information; animals process sensory input in their brains to guide behavior (LS1.4.D1).

Essential Question:

- How do organisms receive and process information?

Knowledge & Skills

- **Knowledge:**
    - Plants and animals have internal/external structures with specific functions.
    - Sense receptors are specialized for particular stimuli and inform behavior.
    - Structures work together as systems to support survival and reproduction.
- **Skills:**
    - Develop and use models to represent how animals process sensory information.
    - Construct evidence-based arguments connecting structure, function, and survival.
    - Evaluate evidence for relevance and sufficiency in supporting claims about systems in plants and animals.

Performance Tasks

1. **4-LS1-1:**
    - Make claims about the function of internal and external structures in plants and animals.
    - Identify and describe evidence supporting these claims.

    - Connect evidence through reasoning to show how structures work together as systems for survival, growth, behavior, and reproduction.

Learning Activities

- **Pre-Assessment:** BrainPop checks and individual Mystery Science standard assessments.
- **Experiments & Models:** Students explore light and sound, test sensory responses, and create models to demonstrate information processing in animals.

Land Detectives

Grade: 4
Subject: Science (STEAM approach)
Unit Focus:
Students explore the interdependence of humans and the land, including how natural forces shape Earth and how humans can reduce hazards.

Key Understandings & Standards

- **Earth Materials and Systems:** Rainfall, wind, ice, and living organisms break down rocks, soil, and sediments and move them around (4-ESS2-1).
- **Plate Tectonics & Earth Patterns:** Mountain ranges, ocean trenches, earthquakes, and volcanoes occur in patterns, often along continental boundaries (4-ESS2-2).
- **Biogeology:** Living things affect the physical characteristics of their regions (4-ESS2-1).
- **Hazard Awareness:** Humans can reduce the impact of natural hazards through informed actions (4-ESS3-4).

Essential Question:

- How can we reduce negative impacts of natural hazards and resource use?

Knowledge & Skills

- **Knowledge:**
    - Patterns in Earth's features reveal the effects of weathering, erosion, and tectonic activity.
    - Living organisms influence the landscape and ecosystems.
- **Skills:**
    - Make observations and measurements to investigate weathering, erosion, and landscape changes.
    - Analyze and interpret map data to identify patterns of Earth's features.
    - Reason about cause-and-effect relationships between natural processes and landforms.

Performance Tasks

1. **4-ESS2-1:**

    - Investigate weathering and erosion using observations and measurements.
    - Collect data on slope, type of erosion, and environmental factors.
    - Use data to explain cause-and-effect relationships in land changes.
2. **4-ESS2-2:**
    - Organize map data into graphs, tables, or charts.
    - Identify patterns in mountains, volcanoes, earthquakes, and trenches.
    - Interpret patterns to explain how Earth's features form and occur.

Learning Activities

- Observations of landforms and erosion processes.
- Map analysis to identify patterns of geological features.
- Investigations connecting human activity and natural processes.

Ocean Waves

Grade: 4
Subject: Science (STEAM approach)
Unit Focus:
Students apply knowledge of light and sound waves to water waves, including hands-on exploration in kayaks and sailboats on Long Island Sound.

Key Understandings & Standards

- **Wave Properties:** Waves are regular patterns of motion in water. Water moves up and down; there is no net motion except at shorelines (4-PS4-1).
- **Wave Characteristics:** Waves can differ in amplitude (height) and wavelength (distance between peaks) (4-PS4-1).
- **Light & Information:** Light allows objects to be seen; digitized information can be transmitted and decoded using technology (4-PS4-2, 4-PS4-3).

Essential Question:

- What effect can water have on land?

Knowledge & Skills

- **Knowledge:**
    - Waves are created by disturbing water surfaces.
    - Wave amplitude and wavelength vary.
    - Light and waves allow us to observe and transfer information.
- **Skills:**
    - Develop and revise models to describe wave phenomena.
    - Use evidence to explain how waves transfer energy and affect objects.
    - Generate and compare solutions using patterns to transfer information.

Performance Tasks

- **Observation & Modeling:**
    - Develop models of waves to show amplitude, wavelength, and effects on objects.
    - Compare multiple solutions to design problems related to wave energy and information transfer.

- **Data & Reasoning:**
    - Identify patterns in wave behavior and effects on the environment.
    - Explain phenomena using empirical evidence and logical reasoning.

Learning Activities

- Hands-on exploration with waves in kayaks and sailboats.
- Modeling wave amplitude and wavelength.
- Using patterns to design solutions for transferring information or understanding wave effects.

Renewable and Nonrenewable Energy

Grade: 4
Subject: Science (Project- and Problem-Based Learning)
Unit Focus:
Students explore energy sources and their environmental impacts by designing a virtual town, constructing windmill blades, and building solar-powered cars to understand renewable and nonrenewable energy.

Key Understandings & Standards

- **Energy Sources:** Humans rely on energy and fuels derived from natural sources. Some are renewable (wind, sunlight, water), and some are nonrenewable (fossil fuels, fissile materials).
- **Environmental Impact:** Energy use affects the environment in multiple ways (4-ESS3-1).
- **Engineering Design:** Students generate and compare multiple solutions to reduce impacts of natural hazards and energy use (4-ESS3-2).

Essential Question:

- How can we reduce negative impacts of natural hazards and resource use?

Knowledge & Skills

- **Knowledge:**
    - Energy sources and their renewability.
    - Environmental effects of energy production.
    - Hazards from natural processes and mitigation strategies.
- **Skills:**
    - Design solutions that convert energy from one form to another.
    - Evaluate solutions based on criteria and constraints (e.g., energy output, safety, materials).
    - Communicate and justify scientific reasoning using evidence.

Performance Tasks

- **Design Challenge:**

    - Build devices (e.g., windmills, solar cars) to convert energy.
    - Identify initial and final forms of energy.
    - Evaluate designs for efficiency and functionality.
- **Assessment Criteria:**
    - Use evidence to explain design decisions.
    - Quantify energy outputs where appropriate.
    - Modify designs based on testing results.

Learning Activities

- Create windmill blades and measure electricity production using KidWind.
- Design and race solar-powered cars.
- Integrate digital and media resources (BrainPOP, CrashCourse Kids) for research and understanding.

Forces and Motion

Grade: 4
Subject: Science (STEAM approach)
Unit Focus:
Students learn about energy through hands-on explorations of motion, collisions, and energy transfer.

Key Understandings & Standards

- **Energy and Motion:** The faster an object moves, the more energy it has (4-PS3-1).
- **Energy Transfer:** Energy can move via moving objects, sound, light, heat, or electric currents (4-PS3-2, 4-PS3-3).
- **Collisions & Forces:** Contact forces transfer energy between objects, changing their motion (4-PS3-3).
- **Engineering Connections:** Students can design, test, and refine devices that convert energy from one form to another (4-PS3-4).

Essential Question:

- What happens when objects collide?

Knowledge & Skills

- **Knowledge:**
    - Speed relates to the amount of energy an object has.
    - Energy can be transferred through collisions, sound, light, heat, or electric currents.
    - Observing collisions helps us understand energy transfer.
- **Skills:**
    - Make qualitative observations to gather evidence about energy.
    - Construct explanations linking motion and energy transfer.
    - Apply scientific ideas to design solutions that manipulate energy.

Performance Tasks

1. **4-PS3-1:**
    - Articulate how an object's speed relates to its energy.

    - Use qualitative evidence (sound, heat, distance moved) to support explanations.
    - Reason about energy transfer and observable effects of motion.

Learning Activities

- **Pre-Assessment:** BrainPop checks and individual Mystery Science standard assessments.
- **Hands-On Exploration:** Students investigate motion, collisions, and energy transfer, observing impacts and reasoning about energy.