Phoenixville Area School District Understanding by Design (UbD) Science Template

Grade Level 5 Unit Name: Ecosystem Interactions & Photosynthesis Authors: B. Douglas & K. Parsons

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="4">Overarching NGSS & PA Standards:

3.1.5.A
Support an argument that plants get the materials they need for growth chiefly from air and water.

3.1.5.B
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

3.2.5.G
Use models to describe that energy in animals’ food</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…

• Develop and/ or use models
• Plan and/ or carry out investigations
• Obtain, evaluate, and communicate information (supported by evidence)
• Construct explanations and design solutions</td></tr>
<tr><td colspan="2">Meaning-Making</td></tr>
<tr><td>Students will understand that…

• Plants acquire their material for growth chiefly from air and water.
• The food of almost any kind of animal can be traced back to plants.
• Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
• Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.”
• Decomposition eventually restores (recycles) some materials back to the soil.
• Organisms can survive only in environments in which their particular needs are met.
• A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.
• Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.
• Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.
• The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).</td><td>ESSENTIAL QUESTIONS
Students will keep considering...
• How does matter and energy move through ecosystems of the biosphere?
• What is food, where does it come from, and how do organisms use it?
• How do plants and animals get nutrients to all of their cells?</td></tr>
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(used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. **3.3.5.C** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **3.3.5.E** Obtain and combine information about ways individual communities use science ideas to protect the earth's resources and environment. **Which branch(es) of science apply:**	• Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). • These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. • Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. • Individuals and communities are doing things to help protect Earth's resources and environments.	• How do animal sensory systems function in the biosphere?
	Knowledge and Skills Acquisition	
	UNDERSTANDINGS *Students will know…* • A system is a collection of interacting objects, ideas, and/or procedures that together define physical entity or process. • 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 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). • A kelp forest has similarities to a rain forest (vertical layering). • Phytoplankton are the major producers in most aquatic systems (both marine and freshwater). • Food webs and competition for resources exist in marine systems. • 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. • Chlorophyll is the green pigment that absorbs sunlight in the cells of producer organisms. • 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. • Green plant cells make sugar (food) from carbon dioxide and water in the presence of sunlight, and release oxygen. • Animals obtain nutrients by eating other organisms. • Digestion is the process used by animals to break down complex food items into simple nutrients.	*Students will be skilled at…* • Developing a model to describe the movement of matter among plants, animals, decomposers, and the environment. • Developing a model to describe phenomena. • Use Science explanations to describe the mechanisms for natural events.

LS, PS, ES

- In vascular plants, 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.
- Vascular bundles are arranged in predictable patterns of veins in the leaves of vascular plants.
- In the human circulatory system, blood transports resources to the cells and waste from the cells. 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.
- 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.
- 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.
- Instinctive behaviors, such as knowing what to eat, how to find shelter, and how to migrate, help organisms survive.
- Marine ecosystems have biotic (living) and abiotic (nonliving parts).
- The ocean plays an important role in the carbon cycle.

KEY VOCABULARY

algae	ocean	herbivore	conservation cycle
atmosphere	River	carnivore	matter
ecosystem	Lake	omnivore	pollutant
environment	Pond	scavenger	water pollution
biome	Estuary	food chain	biosphere
terrestrial	Organism	food web	geosphere
tundra	biotic	population	hydrosphere
deciduous forest	abiotic	community	agriculture industry
rainforest	producer	competition	glacier
grassland	consumer	photosynthesis	groundwater, polar ice-caps
desert	decomposer	organic	
aquatic	predator	biodiversity	
wetland	prey	interdependence	

Stage 2 – Evidence		
Evaluative Criteria	***Assessment Evidence***	
What criteria will be used in each assessment to evaluate attainment of the desired results? Rubrics related to each will be developed. Criterion 2: Three-Dimensional performance assessments require students to make sense of phenomena and solve problems by using the three dimensions together. Assessment tasks elicit	PERFORMANCE TASK(S): Investigations: I. **Task(s):** Students are introduced to a system as a collection of interacting parts that work together to make a whole or produce an action. They explore Earth as a system, focusing on the biosphere and describing ecosystems by looking at the phenomena of feeding relationships and energy transfers, described as food webs. Students model food chains and food webs in a wood ecosystem and a marine ecosystem. Each group of students sets up a redworm habitat to study detritivores and the phenomenon of decomposition in ecosystems. **Assessment:** Investigation 1 I-Check II. **Task(s):** Students investigate the phenomena of nutrient systems of yeast, plants, and animals. They design an investigation to determine the necessary conditions for activating dry yeast. They plant wheat and observe the seedlings to determine which plants have chlorophyll. Students infer that the plants growing in light are producing food to provide nutrients to their cells. Students investigate how animals acquire nutrients by eating and digesting food. **Assessment:** Investigation 2 I-Check III. **Task(s):** Students learn that all cells have basic needs: water, food, gas exchange, and waste disposal. They explore the phenomena of transport systems that multicellular organisms have for moving nutrients and wastes. Students investigate leaf transpiration, model a human heart system, and investigate their lung volume to find out about the interacting parts of the vascular system in plants and the circulatory and respiratory system in humans. **Assessment:** Investigation 3 I-Check IV. **Task(s):** Through video, text, and simulations, students extend their understanding about the phenomena of sensory and motor neurons in brain messages. They explore ways that	Differentiation Considerations: Differentiation Considerations: For labs, some students may wish to: • Explain verbally instead of in a written format • Draw their responses • Write in their first language If challenges arise with the complexity of the task(s), some students may need: • Additional incremental steps • An alternative activity Other considerations: • When grouping students' various skills sets and strengths will be considered

sense-making and problem solving by focusing strongly on reasoning using scientific and engineering evidence, models, and principles.	animals communicate through sound, visual displays, and smell. They find out about the roles that instinct and learned behavior plays in the life of animals. Students revisit the redworm habitats established in Investigation 1 and take a final look at the phenomenon of decomposition. To bring closure to the study of systems, students find out about the North Atlantic Ocean ecosystem and its importance in the carbon cycle. **Assessment:** Investigation 4 I-Check Unit Projects/Activities: 1. Biodomes Engineering Design Project. In this activity, students apply what they learned about plants, animals, and decomposers to design and create a model biodome. Engaging in the engineering design process, students construct a closed (system) environment containing plants and animals existing in equilibrium. Provided with a variety of materials (constraints), teams of students will use their imagination and culminating knowledge to design a biodome structure following the criteria of the activity that models how plants, insects, and decomposers work together in a system. (The activity can be conducted as a structured or open-ended design. It is recommended to allow students the opportunity to be true engineers and follow the open-ended design.)	• When asking students to describe a model, opportunities to draw or write it, as well. • Teacher can scribe written responses for students For the Biodomes Engineering Design Project consider that some students may wish to: Adjust the amount of detail required for the biodome design project. You could have the students create identical plant-only biodomes, using the Figure 1 design, or cover only Parts 1, 2 and 4 of the activity.
What criteria will be used in each assessment to evaluate attainment of the desired results? Rubrics related to each will be developed.	OTHER EVIDENCE: • Checklists of collaborative behaviors in labs and activities • Checklists of collaborative behaviors in class discussions • Daily journal entries • Self-Assessment Rubrics for all performance tasks • Science Notebook • TO CONSIDER FOR LATER: UNIT TEST(S)	Differentiation Considerations: For journal entries, consider that some students may wish to: • draw instead of write entries • write in their first language • record verbally instead of in a written format • annotated notes/slide