Science 8 Unit 7: Photosynthesis and Cycling of Matter 2019

Content Area: **Science**
Course(s): **Life Science 8**
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Length: **1**
Status: **Published**

Unit Overview:

Students provide a mechanistic account for how cells provide a structure for the plant process of photosynthesis in the movement of matter and energy needed for the cell. Students use conceptual and physical models to explain the transfer of energy and cycling of matter as they construct explanations for the role of photosynthesis in cycling matter in ecosystems. They construct scientific explanations for the cycling of matter in organisms and the interactions of organisms to obtain matter and energy from an ecosystem to survive and grow. They understand that sustaining life requires substantial energy and matter inputs, and that the structure and functions of organisms contribute to the capture, transformation, transport, release, and elimination of matter and energy. The crosscutting concepts of *matter and energy* and *structure and function* provide a framework for understanding of the cycling of matter and energy flow into and out of organisms. Students are also expected to demonstrate proficiency in *developing and using models*. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Enduring Understandings:

- Plants need light energy, the green pigment chlorophyll, carbon dioxide and water as reactants and produce oxygen and biomolecules as products of the photosynthetic reactions.
- Plants, green algae, and some bacteria convert light energy to chemical energy in the chemical reactions of photosynthesis.
- The chemical reactions of photosynthesis perform the initial energy conversion from light energy to the energy available to the living world.

Essential Questions:

- How do living things attain the energy they need to live?
- What are the reactants and products of the photosynthetic reactions?

Lesson Titles:

- BTB elodea Lab
- Comic Strips
- Cycles and Photosynthesis Quiz
- Intro to Cycles notes

- Intro to Photosynthesis
- Leaf Craft Activity
- Virtual Lab
- Water Cycle Game

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
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.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Inter-Disciplinary Connections:

LA.RST.6-8	Reading Science and Technical Subjects
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8	Writing History, Science and Technical Subjects
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Students could also perform investigations where the input of light energy is manipulated. In these investigations, students can observe that even if the matter required for photosynthesis is present, the process will not proceed if light energy is not available. If light is available, students will be able to test the leaves of certain plants for the presence of stored sugar in the form of starch. If light is not available, students will observe that the sugars are not stored as starch in the leaves. This will emphasize that the transfer of light energy drives the cycling of matter into chemical energy. Students can also trace the flow of energy using models such as energy pyramids.

- Students will construct explanations about the role of photosynthesis using evidence obtained from sources, including the students' own experiments or outside sources. Student-constructed informative/explanatory responses will cite specific textual evidence, determine the central ideas to support their analysis, and provide an accurate summary distinct from their own prior knowledge or opinions. Some experiments could include observing elodea releasing oxygen, depriving a plant of sunlight or water, or using glucose test strips. In this unit of study, emphasis is on the transfer of energy that drives the motion and/or cycling of matter.

- Introduction to photsynthesis notes and virtual lab

- Student learning will progress to developing and using models to describe how food is rearranged through chemical reactions. These reactions form new molecules that support growth and/or release energy as the matter moves through an organism. Students can integrate multimedia and visual displays into models to clarify information, strengthen claims and evidence, and add interest. Emphasis is on describing that molecules are broken apart and reassembled and that in this process, energy is released. Student models will demonstrate that matter is conserved in cell respiration. Models can be created using materials similar to those used in students' photosynthesis models, thereby emphasizing the complementary nature of photosynthesis and cellular respiration. Students can also act out the roles of variables within the chemical-reaction rearrangement to deepen their understanding.

- Students can represent the matter and energy involved in the process of photosynthesis using the equation for this reaction. Using this equation, students can build ball-and-stick models to show how carbon dioxide and water are rearranged to form glucose. Students can also draw conclusions about the cycling of matter and the flow of energy by observing plants such as elodea. By contrasting elodea plants in a variety of controlled environments, students can draw conclusions about how carbon dioxide and oxygen enter and leave organisms.

- Tutoring during Academic Enrichment

- Using the data collected during their investigations and observations of simulations, students construct an explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. They could participate in s short research project in which they will use textual evidence to support their analysis. As part of their research, students will provide an accurate summary of the text they use and determine the central ideas or conclusions of the text. They can they write informative or explanatory texts to explain the process. As a result of their research, students should be able to observe that the information they gather through research supports their scientific observations. They could then make predictions about the impact of different environmental changes on the cycling of matter and flow of energy. For example, students could make predictions about the impact that volcanic eruptions that produce massive clouds of sunlight-blocking ash that linger long periods of time could have on life in the affected area.

Modifications

Formative Assessment:

- 3-2-1 Review

- Anticipatory Set
- Closure
- Kahoot (online game)
- Pair / Share
- Pass-out of Class
- Review Ball
- Survey Students using Technology (Edmodo, Google Classroom, ect.)
- Thumps up/down
- Type 1 Writing Prompt (Brainstorm)
- Warm-Up

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Benchmark Assessment

Skills-based assessment

Reading response

Writing prompt

Lab practical

Summative Assessment:

- Alternate Assessment
- Benchmark
- BTB Elodea Lab
- Comic Strips Project
- Marking Period Assessment
- Vocabulary Quiz

Resources & Materials:

- http://ngss.nsta.org/Resource.aspx?ResourceID=247
- This model unit from Michigan State University includes 11 lessons that guide students through the process of collecting evidence and developing explanations of where the dry matter of plants comes from and of the roles of photosynthesis and respiration in the carbon cycle. Along with the focus on building explanations of these core ideas, the unit explicitly integrates the crosscutting concepts of matter and energy and scale, proportion, and quantity. This unit is built around the question of how small seeds grow into large plants, and the core activities of the unit guide students in tracing the mass changes that occur as seeds germinate and grow. These core activities are supported through a carefully planned sequence of learning and assessment activities that follow a research-based learning progression to support the development of student understanding.