# Oct. 1E Gr.8: Photosynthesis

Content Area: **Science**
Course(s):
Time Period: **October**
Length: **2 Weeks**
Status: **Published**

## Unit Overview

Only plants with chlorophyll can make their own energy from carbon dioxide and sunlight. This process is responsible for all of the energy in the food chain, and we breathe the waste product in the form of oxygen.

## Enduring Understandings

**Lesson Objectives**

By the end of the lesson, students should be able to:

- Describe how photosynthesis transfers energy from the sun into ecosystems.
- Explain the relationship between photosynthesis and cellular respiration.

## Essential Questions

- **Overarching Question**
    - How do organisms live, grow, respond to their environment, and reproduce?
- **Focus Question**
    - How do organisms obtain and use the matter and energy that they need to live and grow?
- **Lesson Questions**
    - How does photosynthesis transfer energy from the sun into food?
    - What is the relationship between photosynthesis and cellular respiration?
- **Can You Explain?**
    - What happens during photosynthesis, and how do some organisms use photosynthesis to live and grow?

## Instructional Strategies & Learning Activities

- The Five E Instructional Model

  Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.

- Engage (45–90 minutes)

  Students are presented with the phenomenon of photosynthesis. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (90 minutes)

  Students investigate questions about photosynthesis and its relationship to cellular respiration. Students complete Hands-On Activities to investigate photosynthesis.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of how organisms use photosynthesis to live and grow.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of photosynthesis as they research solutions to issues associated with the use of genetically modified foods, make animal and plant cell models, examine photosynthesis, and investigate coral bleaching.

- Evaluate (45–90 minutes)

  Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

## Integration of Career Readiness, Life Literacies and Key Skills

Students will work in small groups or partnerships to conduct investigations, build models or prototypes and present findings.

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| TECH.9.4.8.CI.4 | Explore the role of creativity and innovation in career pathways and industries.<br>Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation. |
| WRK.9.2.8.CAP.3 | Explain how career choices, educational choices, skills, economic conditions, and personal |

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| | behavior affect income. |
| TECH.9.4.8.IML.1 | Critically curate multiple resources to assess the credibility of sources when searching for information. |
| TECH.9.4.8.CI.3 | Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). |
| WRK.9.2.8.CAP.2 | Develop a plan that includes information about career areas of interest. |
| WRK.9.2.8.CAP.1 | Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest. |
| | Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work. |
| TECH.9.4.8.DC.2 | Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). |
| TECH.9.4.8.DC.1 | Analyze the resource citations in online materials for proper use. |

## Technology and Design Integration

Technology is fully integrated using Discovery Techbook.

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| | Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem. |
| CS.6-8.8.1.8.DA.1 | Organize and transform data collected using computational tools to make it usable for a specific purpose. |
| | People use digital devices and tools to automate the collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data. |
| CS.6-8.8.1.8.CS.4 | Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems. |

## Interdisciplinary Connections

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| LA.SL.8.4 | Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. |
| LA.RI.8.1 | Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text. |
| LA.W.8.1 | Write arguments to support claims with clear reasons and relevant evidence. |
| LA.RI.8.4 | Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts. |
| LA.W.8.7 | Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| LA.RI.8.7 | Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea. |
| LA.W.8.2 | Write informative/explanatory texts to examine a topic and convey ideas, concepts, and |

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| | information through the selection, organization, and analysis of relevant content. |
| LA.RI.8.8 | Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced. |
| LA.RI.8.10 | By the end of the year read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed. |
| LA.SL.8.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. |

## Differentiation

Struggling Students

1. Aid students in completing the Hands-On Activity "Photosynthesis." You may wish to model the entire procedure. Alternatively, model the procedure step-by-step and have students complete each step as it is demonstrated.
2. Reshow the video segment "Chloroplast: Structure and Function" so students can make more observations.

ELL

1. Encourage students to demonstrate their understanding by drawing concepts. For example, they can create their own plant structure and photosynthesis diagrams.

Accelerated Students

1. Before they read the Core Interactive Text, have students discuss why almost all plants are green. After they have completed the session, have them compare their original ideas with their new understandings about photosynthesis.
2. Ask students to think about how their observations in the Hands-On Activity "Starch and Photosynthesis" compare with their current knowledge of plants. What real life examples can they relate to this lab?

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to

create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.
- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered

## Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

**Modifications and Accommodations used in this unit:**

In addition to differentiated instruction, IEP's and 504 accommocations will be utilized.

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## Benchmark Assessments

**Benchmark Assessments** are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

**Schoolwide Benchmark assessments:**

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

**Additional Benchmarks used in this unit:**

Pre and post assessments to measure growth.

## Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

**Formative Assessments used in this unit:**

See assessments located in links above.

## Summative Assessments

**Summative assessments** evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

**Summative assessments for this unit:**

See assessments located in links above.

## Instructional Materials

See materials located in links above.

Discovery Techbook

Teacher made materials

Additional labs are available through NJCTL on-line curriculum

## Standards

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| SCI.MS-LS1 | From Molecules to Organisms: Structures and Processes |
| SCI.MS-LS1-6 | Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. |
| MA.6.EE.C.9 | Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. |
| SCI.MS.LS1.C | Organization for Matter and Energy Flow in Organisms |
| SCI.MS-LS1-7 | Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. |
| SCI.MS.PS3.D | Energy in Chemical Processes and Everyday Life |
| | The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. |
| | Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. |