



PUZZLE: FILM A 2-MINUTE VIDEO DEMONSTRATING THE PROCESS OF PHOTOSYNTHESIS

STANDARDS & CONNECTIONS: NGSS.3-5-ETSI, NGSS.MS-ETSI, NGSS.HS-LSI-5, NGSS.HS-LS2-5

SUGGESTED MATERIALS: Access to the internet, cell phones, prop materials (paper, scissors, markers, etc.)

BACKGROUND: All plants, algae, and even some microorganisms use photosynthesis. Photosynthesis is the transfer of energy from the sun to a plant. The formula for photosynthesis is $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6$ (sugar) + 6O_2 . By taking in water (H_2O) through the roots, carbon dioxide (CO_2) from the air, and light energy from the sun, plants can perform photosynthesis to make glucose (sugars) and oxygen (O_2). After the sugar is produced, it is then broken down by the mitochondria into energy that can be used for growth and repair. The oxygen is released into the atmosphere through the leaves, providing oxygen to other life forms on earth that need it – like humans!

1. IDENTIFY: Share the background information with the students, then share the puzzle to be solved. Determine constraints (e.g., time allotted, space, materials provided, etc.) and divide students into small groups.

2. IMAGINE: Ask a series of questions to help students brainstorm solutions to the puzzle. Encourage students to list all ideas – don't hold back! Before moving on, make sure each group selects a solution that fits within the constraints.

- Ask: *How can you solve this puzzle? Which of your ideas can you build a prototype for given the constraints?*

3. DESIGN: Students diagram the prototype, identify the materials needed to build the prototype, and write out the steps to take. Students describe the expected outcomes.

- Ask: *What steps will you take to create your solution? What do you expect your solution to look like and be able to do?*

4. CREATE: Students follow their design plan and build their prototypes. Monitor their progress and remind them about how much time they have.

5. TEST & IMPROVE: Students evaluate their creation and compare it with the expected outcomes. Students seek areas of improvement and make changes where needed.

6. SHARE: Students share their solution to the puzzle and communicate lessons learned.

- Ask: *What was your biggest takeaway? What would you do differently?*

ADDITIONAL RESOURCES: For more background information on this topic, please visit www.purpleplow.org.



Encourage students to be creative and to use props! Create a list of key vocabulary you'd like them to include in their video.

¹ Smithsonian Science Education Center. (2018, April 12). *What is photosynthesis?* Retrieved from <https://ssec.si.edu/stemvisions-blog/what-photosynthesis>