

Grade 10 Teacher Resource- Investigating Photosynthesis and Plant Growth

Curricular Outcome: Science 10 “Energy is conserved, and its transformation can affect living things and the environment.

Core Concepts:

Plants transform light energy into chemical energy through photosynthesis

Energy is conserved and transformed and cannot be created or destroyed.

Energy availability can affect the growth and survival of organisms

Environmental conditions influence the rate of photosynthesis

Changes in energy availability impact ecosystems and biodiversity.

Big Questions:

How do plants obtain and use energy?

How is energy transformed during photosynthesis?

How does the environment affect photosynthesis?

Why are plants essential to ecosystems?

Learning Outcomes:

Students will:

Explain how photosynthesis transforms energy

Investigate how surrounding conditions impact plant growth

Collect and analyze scientific data

Draw conclusions based on evidence

Find how photosynthesis relates to energy flow in ecosystems

Introduction:

Display photographs of healthy and unhealthy plants. Ask the students to brainstorm the following questions in groups:

Why do some plants survive better than others?

What do plants need to survive?

Where does the mass of a plant come from?

How does energy move from the sun to the ecosystem?

Introduce photosynthesis as the process that allows plants to utilize sunlight, converting it into chemical energy.

Students should have a basic understanding of photosynthesis, what is required for the process, and how energy is converted. This video can be used to introduce/ refresh the topic: <https://www.youtube.com/watch?v=CMiPYHNNg28>

Following the video, discuss with the class concepts from the video such as:

What is the original source of energy for most ecosystems?

How do plants capture energy?

What happens if a plant receives less light?

Students will investigate how a plant's environment affects growth, using their observations as evidence of energy transformation.

Main Activity:

This activity can be completed in groups or as a class, depending on resources, time constraints, and preference. The following materials are needed per class/group/student:

2-4 identical small plants (we recommend bean plants)

Pots and soil, if needed

Watering source

Rulers

Data collection sheet (attached)

Light sources and/or access to windows

Plastic wrap (optional, but recommended)

Labels for plants

The plants will be grown under different environmental conditions, while all other variables will be kept the same.

For example, Plant A will be in full sunlight, Plant B will be in reduced sunlight, Plant C could have a colour filter on it, and Plant D would be in darkness.

After deciding the plant environmental conditions, students should:

1. Develop a hypothesis
2. Measure the initial height of each plant
3. Record observations at the start of each class
4. Measure plant height over 1-2 weeks
5. Document leaf colour, number, and health.

Students will then analyze which plants grew the most, which were healthiest, how energy influenced growth, and what evidence they can use to support their conclusions.

Reflection Activity:

Prompt students to answer as many or as few questions as you prefer. You can conduct this part of the activity verbally, or by writing the questions on the board.

1. How does photosynthesis transform energy?
2. Why did some plants grow differently than others?
3. What evidence suggests that light affects plant growth?
4. How would reduced plant growth affect other organisms in an ecosystem?
5. Demonstrate the series of events that take place between the sun shining down on plants, to energy being available to the ecosystem as a whole:

Sunlight →

6. Why are plants considered the foundational energy source of most food webs? How would you define decomposers?
7. How might environmental changes such as increased wildfire smoke or shorter growing seasons affect photosynthesis in Yukon ecosystems?