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# Interactive Learning Objects

## Biology

### Photosynthesis Lesson Plan

**TV**Ontario





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# Photosynthesis

## Learning object description

Photosynthesis is a complex biochemical pathway involving many chemical reactions. In this learning object, students examine the overall equation for photosynthesis [light (energy) + 6H<sub>2</sub>O + 6 CO<sub>2</sub> → C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>] to find the optimal levels of light, carbon dioxide, and water required for the plant to thrive. Students discover that all three are required in order for the plant to grow; even if the others are present in high amounts, the absence of the third kills the plants. In other words, they are limiting factors.

## Learning objective

The students will be able to:

- Define limiting factor
- State the reasons why plants require water, light, and carbon dioxide for growth

## Correlation to the Ontario Curriculum

*Grade 10 Science – SNC2D Academic*

- Describe the processes of photosynthesis and cellular respiration as they relate to the cycling of energy, carbon, and oxygen through abiotic and biotic components of an ecosystem (e.g., explain that photosynthesis and cellular respiration are essentially reverse processes, and identify the reactants and products of their overall reactions)

*Grade 11 Biology – SBI3U Academic:*

- Describe the major processes and mechanisms by which plants grow, develop, and supply various products, including energy and nutrition, needed by other organisms
- Demonstrate an understanding, based in part on their own investigations, of the

connections among the factors that affect the growth of plants, the uses of plants, and the ways in which plants adapt to their environment

## Vocabulary

- Limiting factor

## Pre-viewing

- Have students brainstorm a list of what plants need to grow well. The list will likely include water, light, minerals, and carbon dioxide.
- Ask students to consider the sources of each of these required substances. Review the carbon cycle with them.

## While viewing

- Have the class work either individually or in pairs, depending on your and their preference and access to computers.
- Isolating one variable at a time, tell students to predict what effect changing each variable (water, carbon dioxide, and light) will have on the growth of the plant. Have students make a table in which to collect their data, similar to the one shown below:

(table located on next page)

Variable(s)	Level	Predicted effect	Observed effect on oxygen production	Observed effect of glucose production

- Tell students that they will have to work up to changing two and three variables at a time, so they must keep careful records of what changes they have already investigated.

### Post viewing

- Have students compare their findings with others.
- Each student should then write a paragraph to explain why, given the overall equation for photosynthesis shown in the learning object, water, light, and carbon dioxide are limiting factors for plant growth.

### Follow-up activity

- Now that the class has a good understanding of the requirements of photosynthesis, challenge students to design their own experiments to find the optimal conditions for plant growth. You may wish to assign particular plant species or let students bring in their own plants to work with.

### Assessment

- Students' data tables can be assessed for Inquiry: organization and collection of data [application of the skills and strategies of scientific inquiry, e.g., initiating and planning, performing and recording, analysing and interpreting, problem solving].
- Their final statements can be assessed for Knowledge and Understanding: understanding of concepts, principles, laws, and theories (e.g., identifying assumptions; eliminating misconceptions; providing explanations).
- Students' lab reports can be assessed for Inquiry: application of the skills and strategies of scientific inquiry (e.g., initiating and planning, performing and recording, analysing and interpreting, problem solving).