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What Are Plants Made of?

What Are Plants Made of?

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Table of Contents:

Goals and Objectives	3
Florida Standards	4
Course Outline and Overview	5
Lesson Plan and Step-by-Step Guide	6-8
Resource List	9
Adapter Application	10
Documents, Forms and Illustrations	11-16

Goals and Objectives:

The objective of this lesson is to engage students in exploring the connections between plants and the environment.

This lesson provides an interactive way for students to learn about how plants grow, understand photosynthesis and the carbon cycle. It is also an opportunity for students to realize how plants contribute to the mitigation of global warming through CO2 absorption.

It is comprised of two phases; phase one where students learn/review the major physiological processes associated with plants, and phase two where they demonstrate an understanding by explaining how the physiological processes are tied into plant growth.

The writing portion of this project helps students formulate arguments and responses based on their previous knowledge, and evaluate and summarize other groups' responses. It is easy to do, cheap, interactive, incorporates movement, and the students love it.

Florida Standards:

SC.912.L.18.9 Explain the interrelated nature of photosynthesis and cellular respiration.

SC.912.L.18.7 Identify the reactants, products, and basic functions of photosynthesis.

LAFS.1112.RH.1.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.

Course Outline and Overview:

This activity is for groups of 3-4 students and can be completed in approximately 4 class hours. Phase one reviews plants' major physiological processes and phase two where they make connections. It is based on a textbook illustration puzzle and a video that introduces the concept of how plants use the resources they need in order to grow. The activity expands into several questions which are addressed by the different groups, one at a time, in a questions carousel fashion as the students move around the classroom. After answering the questions, each group revisits the answers given by all groups, and at the end, they evaluate and summarize the responses given by the other groups.

Lesson Plan and Step-by-Step Instructions:

Lesson Title: What are plants made of?

Background Knowledge: notions of photosynthesis, cell respiration, and plant transpiration.

Phase One:

1. Review the major physiological processes associated with plants. This first phase can be done as a puzzle in separate groups or with the classroom as a whole.

2. Students are given one copy of the Tree Diagram Blank and the Tree Diagram Puzzle Pieces, and put them together.

3. Each student copies the completed Tree Diagram in their notebooks.

4. As a group, answer the Tree Diagram Questions listed below:

    a) Write down the equation for photosynthesis.

    b) Write down the equation for cellular respiration.

    c) Write down in detail the route taken by CO2 in the plant.

    d) Write down in detail the route taken by O2 in the plant.

    e) Which compounds absorb light from sunlight for photosynthesis?

f) Describe the properties of water that makes transpiration and movement through the xylem possible.
g) Draw a stoma with its parts. Describe how it works.

h) What is the difference between xylem and phloem?

Phase Two:

1. Preliminary activity:
   a. Watch the Video linked: (the 2 videos are identical \ choose the one that works best for you). I recommend watching it two times.

   Where Do Trees Get Their Mass? (YouTube)

   What are trees made of? (TedEd)

2. Students take notes during the video. Class discussion follows.

3. Question Carrousel set-up:
   a. Make 6 question stations around the classroom, print each question separately and tape/glue it to each poster board. You may also write the questions on the poster boards as well.
   b. Provide writing materials for each station such as colored crayons, markers, pens and pencils.

4. Question stations for Question Carousel: (see instructions below)
   a. What is the contribution of soil as trees grow and acquire mass?

   b. What is the relationship between energy and matter?

   c. What do plants need to acquire mass as they grow?

   d. What is the role of water in plant nutrition?

   e. How does sunshine help plants acquire mass?

   f. What is the role of transpiration in plant nutrition?

Question Carrousel Instructions

Part 1: Answering the questions

1. Watch video as a classroom, class discussion after the movie.
2. Each group starts the question carousel in one of the question stations, which will be their **home question**.
3. Groups answer each question together, writing down their answers on the poster board provided - 3 minutes (you may use background music and a timer here, time may be increased if you feel the kids need more time). Students may use graphs, cartoons, illustrations to illustrate their answers.
4. Group moves to the next question station and answer next question on the poster board - 3 minutes
5. Repeat until each group returns to their **home question**.

Part 2: Reviewing the answers

6. In this part, students review the answers given by all groups in each poster board. They make comments or ask questions about other groups' answers - 2 minutes (you may use the timer here, time may be increased if you feel the kids need more time). Students may use graphs, cartoons, illustrations to illustrate their answers.
7. Group moves to the next question station, reviews all answers and make comments/questions on other answers - 2 minutes (you may use the timer here, time may be increased if you feel the kids need more time)
8. Stop when each group returns back to their **home question**.

Part 3: Evaluation and summarizing

9. Each group works on their **home question** poster board. Give each group a copy of the Video Questions Evaluation and Reflection. They evaluate all answers given including comments and questions and write a summary in the back of the poster board by reflecting on the following questions:
    - How good is the class knowledge of the concepts discussed today?
    - Is there some topic(s) that needs reviewing?
    - What are the strong and weak points from the answers and comments provided?
    - Any other comments?

Resource List:

In order to complete this project teachers will need a screen to project the video (it can also be watched on the student's computers but I find it better to be watched as a class).

For phase one, make copies of the Tree Diagram Blank and Tree Diagram Puzzle Pieces, and Tree Diagram Questions, one per group.

Note: Tree Diagram Puzzle was adapted from: http://bio1151.nicerweb.net/Locked/media/ch36/36_02VascPlantTransport.jpg

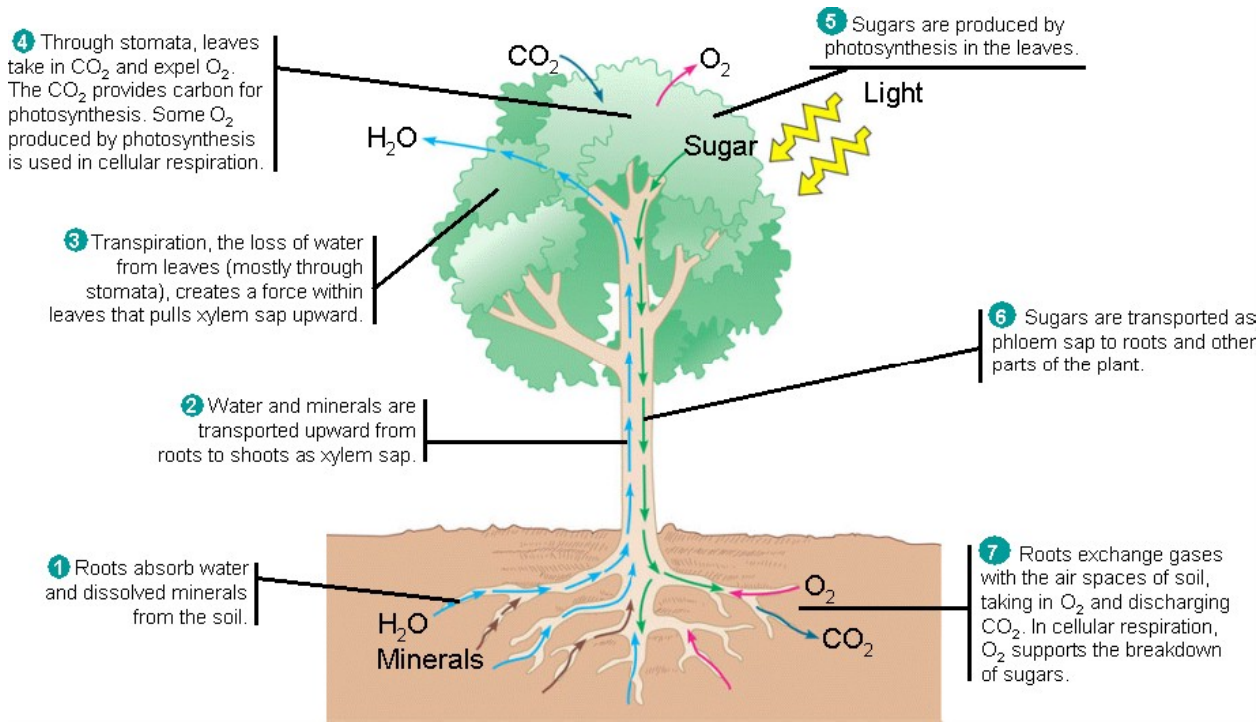
For phase two, set up the classroom in 6 stations. Each station contains a poster board or a large piece of paper with one of the questions written, taped or glued to the poster board and writing supplies such as markers, pencils, and pens. Make six copies of the Video Questions Evaluation and Reflection, one for each poster board station. The whole classroom will be used for this project. For the rotation you may play soft music and use a timer.

List of materials: computer and screen to project video, copies of the Tree Diagram Blank, Tree Diagram Puzzle Pieces, and Tree Diagram Questions. Six poster boards or large pieces of paper, questions written or printed and attached to each poster board, six copies of the Video Questions Evaluation and Reflection, writing equipment (markers, crayons, colored pencils and pens), music and a timer.

Adapter Application:

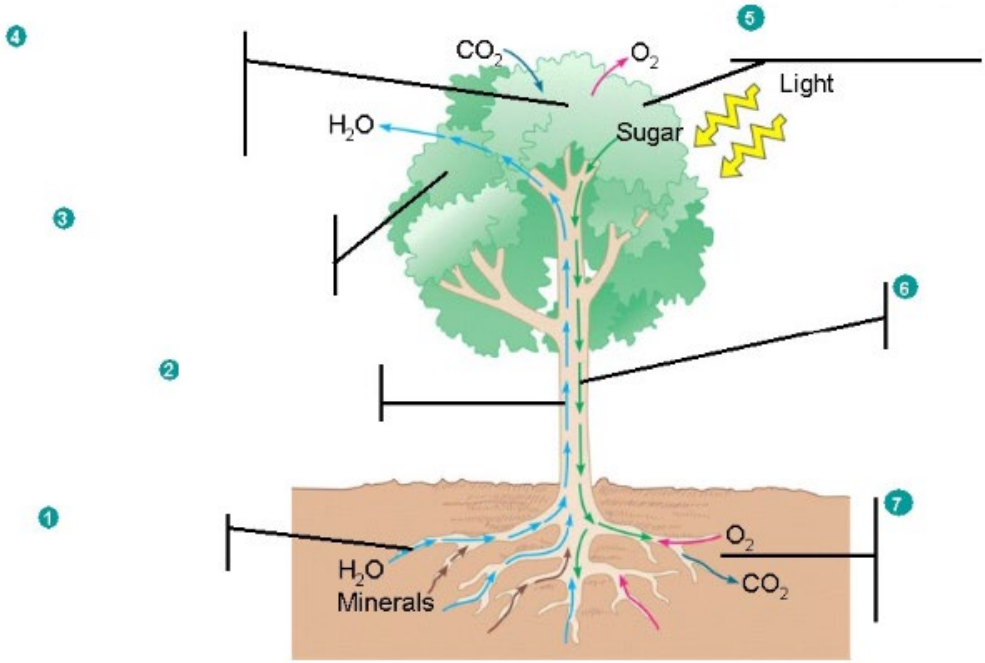
This project works well for classes with 24 or less students but it can be modified for or doubled for larger groups of students (12 groups instead of 6 - run 2 carousels at the same time). It is geared for high school students but can be modified for middle school by changing or adapting the questions attached if necessary.

Tree Diagram Completed



Adapted from: http://bio1151.nicerweb.net/Locked/media/ch36/36_02VascPlantTransport.jpg

Tree Diagram Blank



Tree Diagram Puzzle Pieces

Roots absorb water and dissolved minerals from the

Water and minerals are transported upward from

Transpiration, the loss of water from leaves (mostly from stomata), creates a force within leaves

Through stomata, leaves take in CO_2 and expel O_2. The CO_2 provides carbon for photosynthesis.

Sugars are produced by photosynthesis in the leaves.

Sugars are transported as phloem sap to roots and other

Roots exchange gasses with the air spaces of soil, taking in O_2 and discharging CO_2. In

Tree Diagram Questions:

1. Write down the equation for photosynthesis.

2. Write down the equation for cellular respiration.

3. Write down in detail the route taken by CO2 in the plant.

4. Write down in detail the route taken by O2 in the plant.

5. Which compounds absorb light from sunlight for photosynthesis?

6. Describe the properties of water that makes transpiration and movement through the xylem possible.

7. Draw a stoma with its parts. Describe how it works.

8. What is the difference between xylem and phloem?

“What are plants made of?” Video Questions

1. What is the contribution of soil as trees grow and acquire mass?

2. What is the relationship between energy and matter?

3. What do plants need to acquire mass as they grow?

4. What is the role of water in plant nutrition?

5. How does sunshine help plants acquire mass?

6. What is the role of transpiration in plant nutrition?

Video Questions Evaluation and Reflection:

1. How good is the class knowledge of the concepts discussed today?

2. Is there some topic(s) that needs reviewing?

3. What are the strong and weak points from the answers and comments provided?

4. Any other comments?