

## ***IM & Storyline***

Here, we present two ways to think about how lessons are sequenced in the *Plants Unit*. The Instructional Model, immediately below, emphasizes how students take on roles of questioner, investigator, and explainer to learn and apply scientific models they can use to answer the driving question. Further below, the Unit Storyline Chart highlights the central question, activity, and answer that students engage with in each lesson of the *Plants Unit*.

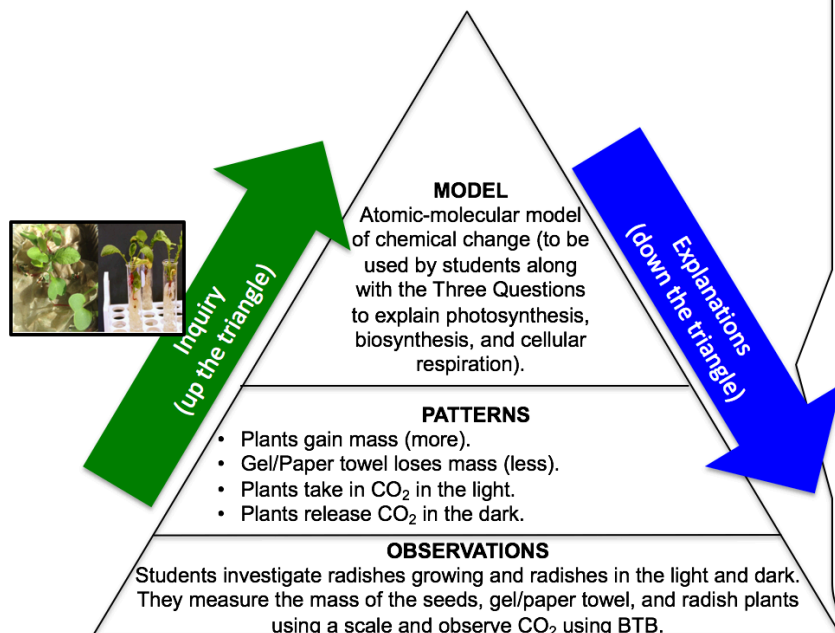
### **Instructional Model**

Like all *Carbon TIME* units, this unit follows an instructional model (IM) designed to support teaching that helps students achieve mastery at answering the driving question through use of disciplinary content, science practices, and crosscutting concepts. To learn more about this design, see the [Carbon TIME Instructional Model](#).

The core of the *Carbon TIME* IM is the Observation, Patterns, Models (OPM) triangle, which summarizes key aspects to be attended to as the class engages in unit inquiry and explanation. The OPM triangle for the *Plants Unit*, shown below, articulates the key observations students make during the unit investigation, the key patterns they identify through analyzing their investigation data, and the central scientific model that can be used to answer the unit's driving question. During the inquiry portion of the unit (Lesson 3), the class moves from making observations to identifying patterns, eventually using these patterns to make evidence-based arguments. During the explanation portion of the unit (Lessons 4, 5, and 6), the class learns the atomic-molecular model, makes connections across scales, and uses the atomic-molecular model to explain how animals grow, move, and function. Across the unit, classroom discourse is a necessary part of 3-dimensional *Carbon TIME* learning. The [Carbon TIME Discourse Routine](#) document provides guidance for scaffolding this discourse in lessons.

*Observations, Patterns, Models, and Explanations in the Plants Unit*

# Observations, Patterns, & Models in the *Plants Unit*



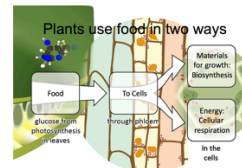
## Explanations Using Three Questions

### Matter Movement

- Carbon atoms enter plants in CO<sub>2</sub> molecules that are absorbed through the leaves, where they become part of glucose (sugar) molecules.
- The sugar molecules travel through the stems and roots to all of the plant's cells.
- Some of the carbon atoms stay in the cells, as they are incorporated into the large organic molecules that make up cell structures through biosynthesis.
- Some of the sugar molecules are oxidized in the process of cellular respiration. They leave the plant in CO<sub>2</sub> that diffuses through plant surfaces.

### Matter Change and Energy Change

- Photosynthesis.** Plants' leaf cells absorb CO<sub>2</sub> and water. They use energy from sunlight to rearrange the atoms into new molecules glucose and oxygen. Glucose has chemical energy stored in C-C and C-H bonds.
- Biosynthesis and growth.** Plants grow when their cells grow and divide through the process of biosynthesis. Plants cells combine glucose with soil minerals to make other small organic molecules. Then they combine small organic molecules to make the large organic molecules needed for cells' structure and function.
- Cellular respiration.** Plants cells get the energy they need to move and function by combining sugars and other small organic molecules with O<sub>2</sub>, releasing energy when high-energy C-C and C-H bonds are replaced by lower-energy bonds in CO<sub>2</sub> and water.



## Unit Storyline Chart

Another way to familiarize yourself with the sequence of lessons in the *Plants Unit* is with the Unit Storyline Chart depicted below. The Unit Storyline Chart summarizes a unit phenomenon-based driving question associated with each lesson, what classes will do in each lesson to address the question, what conclusions they will come to, and how they will transition to a subsequent lesson.

