**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*
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.
Lesson 1: Expressing Ideas
Students will take a pretest and share their initial ideas on the Expressing Ideas and Questions Tool about plant growth, identifying what plants need to grow and gain mass.

Lesson 2 Foundations: Zooming into Plants
Students will "zoom into" food and examine nutrition labels to learn about the materials in plants, animals, and food including organic materials (fats, carbohydrates, and proteins).

Lesson 3: Investigating Plants
Students conduct investigations to explore what happens when plants grow and when plants are left in the light and in the dark. They use the Predictions and Planning Tool and the Evidence-Based Arguments Tool.

Lesson 4: Explaining How Plants Make Food, Move, and Function
Students model cellular respiration and photosynthesis using molecular model kits and use Explanations Tools to explain what happens when plants make food, move, and function.

Lesson 5: Explaining How Plants Grow
Students trace the process involved in a potato growing on a poster of a potato, construct a model of the building of molecules through biosynthesis and use Explanations Tools to explain biosynthesis.

Lesson 6: Other Examples of Digestion, Biosynthesis, and Cellular Respiration
Students practice explaining photosynthesis, biosynthesis, and cellular respiration in other plants and then take the unit posttest.

Plants are made of small and large organic molecules that contain matter and chemical energy, as well as water and minerals.

The mass of the plant increased, while the mass of the paper towel (or gel) remained the same. In the dark, CO₂ leaves the plant and enters the air. In the light, CO₂ leaves the air and moves into the plant.

Plants make glucose and O₂ from CO₂ and H₂O: the process of photosynthesis. Then they use some of that glucose for cellular respiration: combining glucose with O₂ to make CO₂ and H₂O and providing energy for plant functions.

Some glucose that plants make is combined with soil minerals to make large organic molecules for growth (biosynthesis).

All plants use the same carbon-transforming processes (photosynthesis, biosynthesis, and cellular respiration) to move, grow, and function.