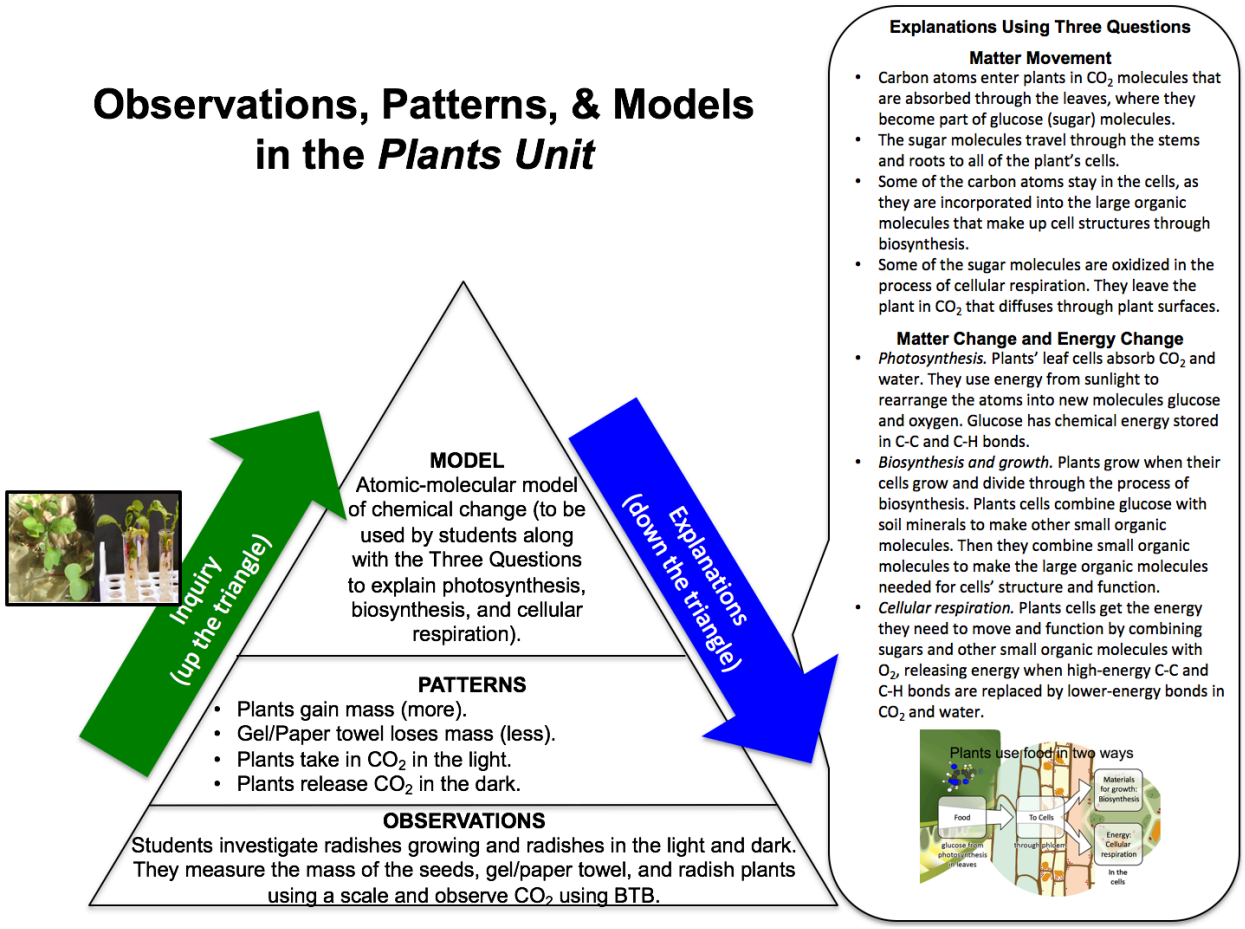
Plants Instructional Model & Storyline Chart

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

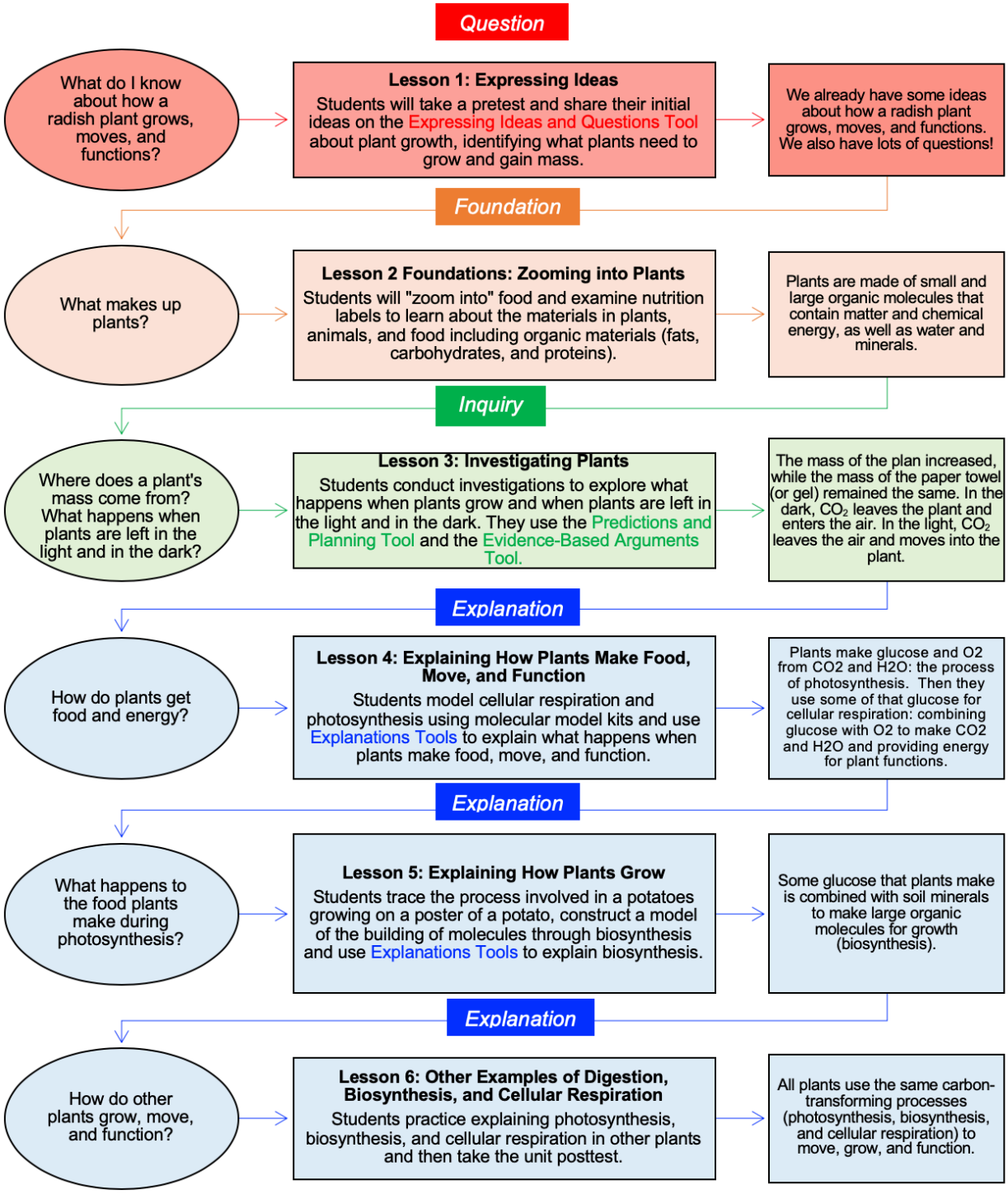
Like all *Carbon TIME* units, this unit follows an instructional model (IM) designed to support teaching that helps students achieve mastery at answering the driving question through use of disciplinary content, science practices, and crosscutting concepts. To learn more about this design, see the *Carbon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



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.


Question
What do I know about how a radish plant grows, moves, and functions?
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.
We already have some ideas about how a radish plant grows, moves, and functions. We also have lots of questions!
Foundation
What makes up plants?
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).
Plants are made of small and large organic molecules that contain matter and chemical energy, as well as water and minerals.
Inquiry
Where does a plant's mass come from? What happens when plants are left in the light and in the dark?
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.
The mass of the plan increased, while the mass of the paper towel (or gel) remained the same. In the dark, CO_2 leaves the plant and enters the air. In the light, CO_2 leaves the air and moves into the plant.
Explanation
How do plants get food and energy?
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.
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.
Explanation
What happens to the food plants make during photosynthesis?
Lesson 5: Explaining How Plants Grow
Students trace the process involved in a potatoes growing on a poster of a potato, construct a model of the building of molecules through biosynthesis and use Explanations Tools to explain biosynthesis.
Some glucose that plants make is combined with soil minerals to make large organic molecules for growth (biosynthesis).
Explanation
How do other plants grow, move, and function?
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.
All plants use the same carbon-transforming processes (photosynthesis, biosynthesis, and cellular respiration) to move, grow, and function.