

Lesson 1: Pretest and Expressing Ideas

Overview

In this lesson, students take a pretest and share their initial ideas about plant growth, identifying what plants need to grow and gain mass.

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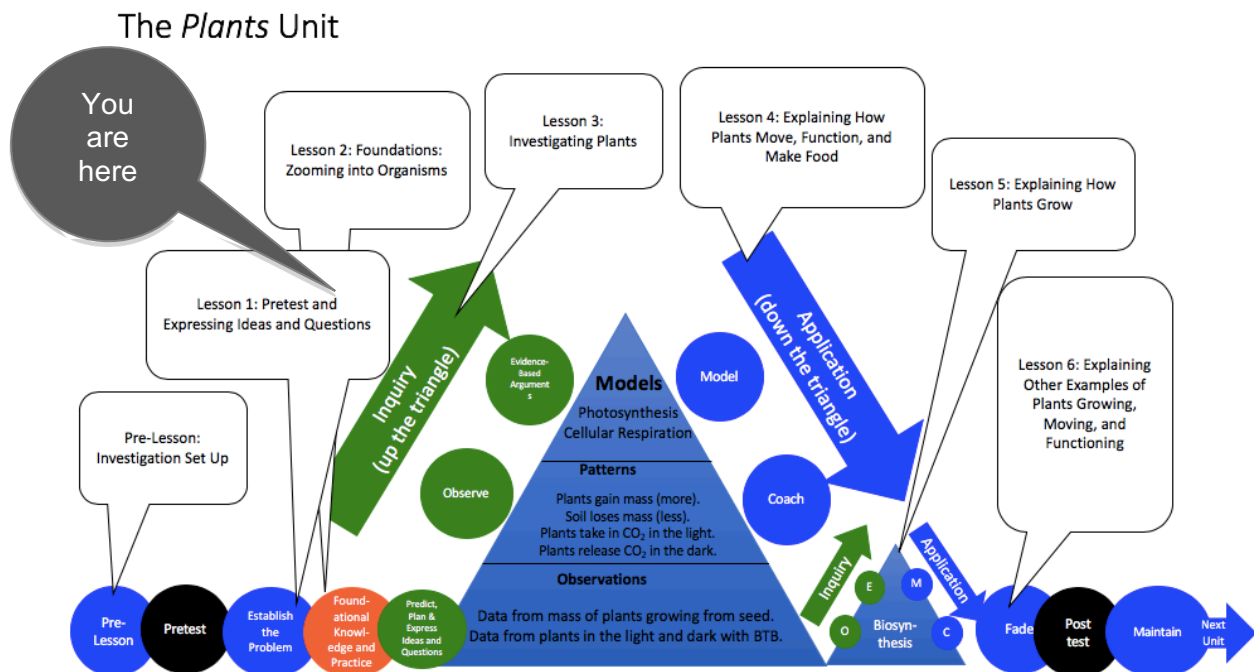
Guiding Question

How does a plant grow?

Activities in this Lesson

- Activity 1.1: Plants Unit Pretest (20 min)
- Activity 1.2: Expressing Ideas and Questions about How Plants Grow (30 min)

Unit Map



Tab 2: Learning Goals

Target Performances

Activity	Target Performance
<i>Lesson 1 – Pretest and Expressing Ideas (students as questioners)</i>	
Activity 1.1: <i>Plants Unit Pretest</i>	Students show their initial proficiencies for the overall unit goal: Questioning, investigating, and explaining how matter and energy move and change as plants live, move, and grow.
Activity 1.2: Expressing Ideas and Questions about How Plants Grow	Students ask and record specific questions about changes in matter and energy in response to the unit

Activity	Target Performance
	driving question: How do you think that a plant grows, moves, and functions?

NGSS Performance Expectations

This lesson helps students start thinking about all the unit NGSS Performance Expectations but does not feature a mastery of any of them.

Background Information

Three-dimensional Learning Progression

The pretest and discussion in this lesson (a) help students to anticipate and begin thinking about the questions that they will answer in this lesson and (b) help you as a teacher see how your students reason about matter, energy and the carbon-transforming processes of photosynthesis, cellular respiration, and biosynthesis. In the Application activity Sequence, both Activity 1.1 and Activity 1.2 in this lesson serve as the “Establish the Problem” phase for all the activities in the *Plants Unit*.

Key Ideas and Practices for Each Activity

In Activity 1.1, the unit pretest is useful for two purposes. Your students’ responses will help you decide how much detail you want to include during the unit, particularly details about chemical structures of materials. If your students are mostly at Level 2 in the carbon learning progression, you may want to focus on the main ideas (like the tracing of matter and energy and the Three Questions) rather than chemical structures. Your students’ responses will also provide a starting point for discussions about the focus for this unit.

In Activity 1.2, through the discussion students will come to recognize that they have many different ideas about what how they think plants grow, as well as unanswered questions. We expect many students to express Level 2 or Level 3 ideas, for example, that plants grow because soil minerals coming into the plant through the roots provide energy for plant growth. Though most students will know that plants need light and that light is absorbed by the leaves, even students who know the word “photosynthesis” are likely to be vague about what happens during photosynthesis, particularly that photosynthesis enables plants to use CO₂ as a carbon source for storing chemical energy and building plant tissues.

Key Carbon-Transforming Processes: Photosynthesis, Cellular Respiration, & Biosynthesis

Content Boundaries and Extensions

Talk and Writing

At this stage in the unit, the students will be **Expressing Ideas**. The table below shows specific talk and writing goals for this phase of the unit.

Talk and Writing Goals for Expressing Ideas Phase	Teacher Talk Strategies that Support this Goal	Curriculum Components that Support this Goal
Treat this as brainstorming and elicitation.	<i>Remember, there are no “right” answers at this point. We want to hear all ideas.</i>	Unit Pretest My Students’ Answers

<p>Listen for ideas about what is happening to matter and energy at different scales.</p>	<p><i>Where did the energy come from?</i></p> <p><i>Where does the matter go next?</i></p> <p><i>Are you talking about matter or energy?</i></p> <p><i>What about the atomic-molecular scale?</i></p> <p><i>What about the cellular scale?</i></p>	<p>Unit Pretest</p> <p>Expressing Ideas and Questions Process Tool</p>
<p>Listen for a wide range of student ideas. Press for more complete ideas.</p>	<p><i>Who can add to that?</i></p> <p><i>What do you mean by _____? Say more.</i></p> <p><i>So I think you said _____. Is that right?</i></p>	
<p>Have students compare, contrast, and document their ideas.</p>	<p><i>Who has a different idea?</i></p> <p><i>How are those ideas similar/different?</i></p> <p><i>Who can rephrase _____'s idea?</i></p> <p><i>Let's record our ideas so we can come back to them and see how our ideas change.</i></p>	<p>Sticky notes on the class poster</p> <p>Activity 1.2 Presentation</p>
<p>Encourage students to provide evidence for their ideas.</p>	<p><i>How do you know that?</i></p> <p><i>What have you seen in the world that makes you think that?</i></p>	<p>Sticky notes on the class poster.</p>

Activity 1.1: Plants Unit Pretest (20 min)

Overview and Preparation

Target Student Performance

Students show their initial proficiencies for the overall unit goal: Questioning, investigating, and explaining how matter and energy move and change as plants live, move, and grow.

Resources You Provide

- pencils (1 per student)

Resources Provided

- [1.1 Plants Unit Pretest](#) (1 per student)
- [1.1 Assessing Plants Unit Pretest](#)

Setup

Print one copy of the [1.1 Plants Unit Pretest](#) for each student.

Directions

1. Describe the unit pretest.

Explain the purpose of the unit pretest to students:

- It will help you as a teacher understand how students think about what happens when plants grow.
- It will help them think about what they know and what questions they have.

2. Have students take the unit pretest.

Distribute copies of [1.1 Plants Unit Pretest](#) to be completed with paper and pencil.

Assessment

Use the [1.1 Plants Unit Pretest](#) to assess students' understanding of photosynthesis, cellular respiration, and biosynthesis in terms of learning progression levels. You should not give your students grades on the pretest or expect your students to know the correct answers. The document [1.1 Assessing Plants Unit Pretest](#) has assessment guidelines, identifies correct responses, and explains how students' responses reveal their learning progression levels.

Differentiation & Extending the Learning

Differentiation

- If classroom includes English Language Learners or have other special needs and considerations, you may want to read questions aloud and discuss meaning of questions.

Modifications

Extending the Learning

Activity 1.2 Expressing Ideas and Questions about How Plants Grow (30 min)

Overview and Preparation

Target Student Performance

Students ask and record specific questions about changes in matter and energy in response to the unit driving question: How do you think that a plant grows, moves, and functions?

Resources You Provide

- Sticky notes (1 per student)
- Time-lapse video of plants growing, such as <http://www.youtube.com/watch?v=d26AhcKeEbE>

Resources Provided

- [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#)
- [1.2 Expressing Ideas and Questions Tool for Plants Growing](#) (1 per student)
- [1.2 Assessing the Expressing Ideas and Questions Tool for Plants Growing](#)
- [1.2 Plants Storyline Reading: Learning from the Work of Asima Chatterjee](#) (1 per student)

Recurring Resources

- [Questions, Connections, Questions Student Reading Strategy](#)
- [Learning Tracking Tool for Plants](#) (1 per student)
- [Assessing the Learning Tracking Tool for Plants](#)
- (Optional) [Big Idea Probe: Houseplant for a Busy Family](#) (1 per student)
- (Optional) [Assessing the Big Idea Probe: Houseplant for a Busy Family](#)

Setup

Prepare your computer for showing the PPT as well as a time lapse video of a plant growing. Have 1 copy for each student of [1.2 Expressing Ideas and Questions Tool for Plants Growing](#), [1.2 Plants Storyline Reading: Learning from the Work of Asima Chatterjee](#), and sticky notes. If you are using it, print one copy of the [Big Idea Probe: Houseplant for a Busy Family](#) for each student.

Directions

- 1. Use the instructional model to show students where they are in the course of the unit.**

Show slide 2 of the [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#).

- 2. Have students discuss the unit pretest.**

Ask students to write down questions they have after taking the pretest. Explain that we will try to answer most of those during the *Plants Unit*.

- 3. (Optional) Have students complete the Big Idea Probe: Houseplant for a Busy Family.**

If you decide to use the [Big Idea Probe: Houseplant for a Busy Family](#), have students complete it and share their ideas. See [Using Big Idea Probes](#) and [Assessing the Big Idea Probe: Houseplant for a Busy Family](#) for suggestions about how to use the Big Idea Probe.

4. Have students watch and discuss a time-lapse video of plants growing.

Use the link in slide 3 of the [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#) (or above) to have your students observe a radish plant growing.

- Show Slide 4 and ask students to share ideas about the questions on that slide.
- In response to the second question on the slide about what radish plants need, note whether the students mention four basic needs:
 - Water
 - Air
 - Sunlight
 - Soil nutrients

5. Students complete the Expressing Ideas and Questions Tool on their own.

Show slide 5 of the [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#).

- Tell students that now they will take a few minutes to think and record their ideas about what happens when plants grow on their own.
- Give each student one copy of [1.2 Expressing Ideas and Questions Tool for Plants Growing](#).
- Give students about 5 minutes to complete the tool as individuals.
- Encourage students to think about things they have seen in the world to help inform their ideas.

6. Students compare their own ideas with the ideas of a partner.

Show slide 6 of the [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#).

- Tell students that now that they have had a chance to record their ideas on their own, it is important to compare their ideas to their classmates' to see how they are similar and different, and also so we know how many different ideas there are in the class.
- Divide students into pairs and have students compare their ideas on the [1.2 Expressing Ideas and Questions Tool for Plants Growing](#) with each other. As students are sharing, circulate through the groups. Consider asking questions such as *Do you agree with each other about XX? Where did you learn about that? What experiences have you had to help you with your explanation?*
- At this point, do not correct any wrong ideas; treat this as brainstorming.
- Pay attention to patterns in students' ideas, or specific individual ideas that diverge from the patterns as both may be valuable to discuss as a whole class later.

7. Post ideas for class discussion.

Tell students that now that they have had a chance to write their ideas as individuals and as pairs, it is important to look at the range of ideas in the class. Again, at this point, do not correct any wrong ideas. Treat this as brainstorming: all ideas are on the table.

- Show slide 7 of the [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#).
- Give each pair 2 sticky notes.
- Tell students to write their most important idea from their [1.2 Expressing Ideas and Questions Tools](#) on a sticky note and put it on the board under the "Your Ideas" column.

- Tell students to write their most important question from their [1.2 Expressing Ideas and Questions Tools](#) on a sticky note and put it on the board under the “Your Questions” column.

8. Have a whole class discussion.

Lead a whole class discussion to examine the variety of student ideas and questions on the poster. Use the talk and writing moves at the beginning of this lesson to help with facilitating the class discussion – see the Notes part of the slide.

- Show slide 8 of the [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#). Note that this slide is a duplicate of the previous one but with a new heading. Take this time to discuss students’ ideas, organize them according to patterns, etc.

9. Students read the Plants Storyline Reading

Show slide 9 of the [1.2 Expressing Ideas and Questions about How Plants Grow PPT](#). Have students partner-read the [1.2 Plants Storyline Reading](#) which explains the storyline of the unit and connects it to the work of scientist Asima Chatterjee. Have students read using the [Questions, Connections, Questions Student Reading Strategy](#). See the [Questions, Connections, Questions Reading Strategy Educator Resource](#) document for information about how to engage students with this strategy.

- After pairs are finished reading, have students share with the class what they found interesting and any questions they have.

10. Save the Expressing Ideas and Questions Tools for later.

Show slide 10 of the [1.2 Expressing Ideas and Questions About How Plants Grow PPT](#).

- Tell students that they will revisit these ideas later in the unit to see how their thinking changes.
- The class can also return to shared ideas on Slide 7.

11. Have a discussion to complete the Learning Tracking Tool for this activity.

Show slide 11 of the [1.2 Expressing Ideas and Questions about How Plants Grow PPT](#).

- Pass out a [Learning Tracking Tool for Plants](#) to each student.
- Explain that students will add to the tool after activities to keep track of what they have figured out that will help them to answer the unit driving question.
- Have students write the activity name in the first column, "Expressing Ideas and Questions about How Plants Grow."
- Have a class discussion about what students did during the activity. When you come to consensus as a class, have students record the answer in the second column of the tool.
- Have a class discussion about what students figured out during the activity that will help them in answering the unit driving question. When you come to consensus as a class, have students record the answer in the third column of the tool.
- Have a class discussion about what students are wondering now that will help them move towards answering the unit driving question. Have students record the questions in the fourth column of the tool.
- Have students keep their Learning Tracking Tool for future activities.
- Example Learning Tracking Tool

	Activity Chunk	What Did We Do?	What Did We Figure Out?	What Are We Asking Now?
	Expressing Ideas and Questions Questioner	Take a pretest and share 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!	What makes up plants?

Assessment

Use the student responses to the class discussions and also their ideas on the [1.2 Expressing Ideas and Questions Tool for Plants Growing](#), as well as the [1.2 Assessing the Expressing Ideas and Questions Tool for Plants Growing](#) to assess their thinking at the beginning of the unit. By the end of the unit, students should be able to explain what happens when plants grow and move at macroscopic and atomic-molecular scales. For now, listen to students' ideas, with attention to how they describe matter and energy. Most of your students will probably express learning progression Level 2 or Level 3 ideas at this time.

Tips

If you are teaching this to multiple classes, you can save different versions of the PPT, with Slide 8 completed for each block. Alternatively, have all classes combine their answers and have students look for similarities and differences.

Differentiation & Extending the Learning

Differentiation

- Refer back to Expressing Ideas and Questions from *Systems & Scale* and/or *Animals* as a model
- Strategic grouping with strong speakers
- Provide sentence stems to aid individual writing and for discussion
- Insist on ideas and questions from **all** students
- Emphasize that there are no incorrect answers and check for alternative ideas that may be cultural in nature

Modifications

Extending the Learning