

Lesson 1: Pretest and Expressing Ideas and Questions

Overview

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

Download PDF of Lesson 1 Teacher's Guide

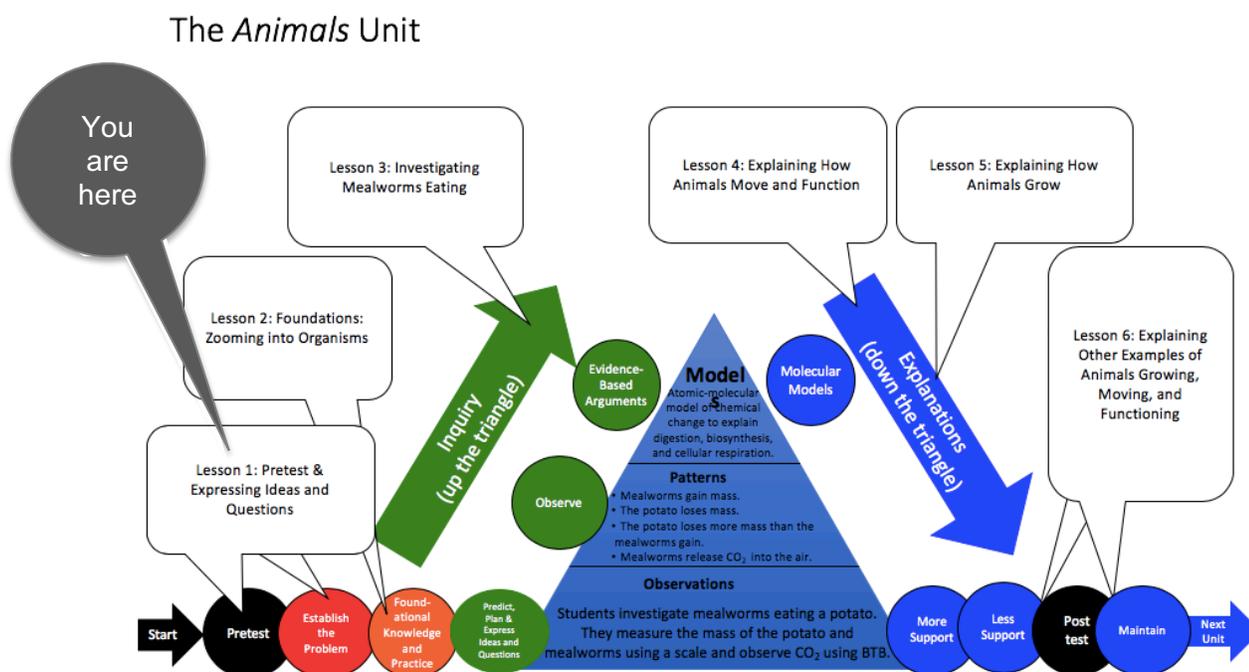
Guiding Question

What happens to food that animals eat?

Activities in this Lesson

- Activity 1.1: Animals Unit Pretest (20 min)
- Activity 1.2: Expressing Ideas and Questions about How Animals Grow (40 min)

Unit Map



Learning Goals

Target Performances

Activity	Target Performance
Lesson 1 – Pretest and Expressing Ideas and Questions (students as questioners)	
Activity 1.1: <i>Animals</i> Unit Pretest	Students show their initial proficiencies for the overall unit goal: Questioning, investigating, and explaining how animals move and change matter and energy as they live, move, and grow.

Activity	Target Performance
Activity 1.2: Expressing Ideas and Questions about How Animals Grow	Students ask and record specific questions about changes in matter and energy in response to the unit driving question: What happens when ethanol burns?

NGSS Performance Expectations

This lesson helps students start thinking about all of 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 student reason about how matter and energy are transformed when animals eat, grow, move, and breathe (digestion, biosynthesis, and cellular respiration). 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 *Animals* 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 demonstration and discussion students will come to recognize that they have many different ideas about what happens when animals grow, as well as unanswered questions. We expect many students to express Level 2 or Level 3 ideas, for example, that animals grow because their cells divide, or that gas has no mass.

Key Carbon-Transforming Processes: Digestion, Biosynthesis, and Cellular Respiration

Content Boundaries and Extensions

Talk and Writing

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

Talk and Writing Goals for Expressing Ideas and Questions Phase	Teacher Talk Strategies that Support this Goal	Curriculum Components that Support this Goal
Treat this as brainstorming and elicitation.	Remember, there are no “right” answers at this point. We want to hear all ideas.	Unit Pretest My Students’ Answers
Listen for ideas about what is happening to matter and energy at different scales .	Where did the energy come from? Where does the matter go next? Are you talking about matter or energy?	Unit Pretest Expressing Ideas and Questions Process Tool

	<p>What about the atomic-molecular scale?</p> <p>What about the cellular scale?</p>	
<p>Listen for a wide range of student ideas. Press for more complete ideas.</p>	<p>Who can add to that?</p> <p>What do you mean by _____? Say more.</p> <p>So, I think you said _____. Is that right?</p>	
<p>Have students compare, contrast, and document their ideas.</p>	<p>Who has a different idea?</p> <p>How are those ideas similar/different?</p> <p>Who can rephrase _____'s idea?</p> <p>Let's record our ideas so we can come back to them and see how our ideas change.</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>How do you know that?</p> <p>What have you seen in the world that makes you think that?</p>	<p>Sticky notes on the class poster.</p>

Activity 1.1: Animals Unit Pretest (20 min)

Overview and Preparation

Target Students Performance

Students complete a pretest to assess their understanding of what happens to matter and energy during combustion.

Resources You Provide

- pencils (1 per student)

Resources Provided

- [Animals Unit Pretest](#) (1 per student)
- [Assessing the Animals Unit Pretest](#)

Setup

Print one copy of the [Animals 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 animals grow, move, and function.
- It will help them think about what they know and what questions they have.

2. Have students take the unit pretest.

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

Assessment

Use the [Animals Unit Pretest](#) to assess students' understanding of digestion, biosynthesis, and cellular respiration 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 [Assessing the Animals Unit Pretest](#) has assessment guidelines and identifies correct responses and explaining how students' responses reveal their learning progression levels.

Differentiation & Extending the Learning

Differentiation

- Be sure that students are comfortable with the technology that they are using and provide assistance when necessary.
- 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 Animals Grow (40 min)

Overview and Preparation

Target Student Performance

Students complete the Expressing Ideas and Questions Tool for animals growing, helping them document, share, and examine their ideas. There are no “right” answers during this phase of the unit.

Materials You Provide

- sticky notes (1 per student)
- time-lapse video of child growing, such as <https://www.youtube.com/watch?v=OLTfq6JjPus&t=1s>

Resources Provided

- [1.2 Expressing Ideas and Questions about How Animals Grow PPT](#)
- [1.2 Expressing Ideas and Questions Tool for Animals Growing](#) (1 per student)
- [1.2 Assessing the Expressing Ideas and Questions Tool for Animals Growing](#)
- [1.2 Animals Storyline Reading: Learning from the Work of Hans Krebs](#) (1 per student)

Recurring Resources

- [Questions, Connections, Questions Student Reading Strategy](#)
- [Learning Tracking Tool for Animals](#)
- [Assessing the Learning Tracking Tool for Animals](#)
- (Optional) [Big Idea Probe: What Happens to the Fat?](#) (1 per student)
- (Optional) [Assessing the Big Idea Probe: What Happens to the Fat?](#)

Setup

Prepare your computer for showing the PPT as well as a time-lapse video of a child growing (<https://www.youtube.com/watch?v=OLTfq6JjPus&t=1s>). Print one copy of the [1.2 Expressing Ideas and Questions Tool for Animals Growing](#), [Big Idea Probe: What Happens to the Fat?](#) (optional), and [1.2 Animals Storyline Reading](#) for each student.

Directions

1. Have students discuss the pretest.

Ask students to write down questions they have after taking the pretest (for instance, on the back of their [1.2 Expressing Ideas and Questions Tool](#)). Explain that we will try to answer most of those during the *Animals* unit.

2. (Optional) Have students complete the Big Idea Probe: What Happens to the Fat?

If you decide to use the [Big Idea Probe: What Happens to the Fat?](#) have students complete it and share their ideas. See [Assessing the Big Idea Probe: What Happens to the Fat?](#) for suggestions about how to use the Big Idea Probe.

3. 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 Animals Grow PPT](#).

4. Have students watch a time-lapse video of a child growing.

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

- You may want to play just the first 45 seconds.

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

Show slide 4 of the [1.2 Expressing Ideas and Questions about How Animals Grow PPT](#).

- Tell students that now they will take a few minutes to think and record their ideas about what happens when animals grow on their own.
- Give each student one copy of [1.2 Expressing Ideas and Questions Tool for Animals 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 5 of the [1.2 Expressing Ideas and Questions about How Animals 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 Animals 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 6 of the [1.2 Expressing Ideas and Questions about How Animals Grow PPT](#).
- Give each pair 2 sticky notes.
- Tell students to write their most important idea from their 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 Expressing Ideas and Questions Tools on a sticky note and put it on the board under the "Your Questions" column.

8. Class discussion

Lead a whole class discussion to examine the variety of student ideas and questions on the poster. Draw out and press students to build on their ideas about what happens to the food that the child eat and what happens to the air that the child breathes in relation to growth, movement, and functioning. 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 7 of the [1.2 Expressing Ideas and Questions about How Animals 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.
- Later, you can use this duplicate slide as a record of class ideas for the future, either by saving the post-it notes or by taking a picture of them.

9. Students read the Animals Storyline Reading

Show slide 8 of the [1.2 Expressing Ideas and Questions about How Animals Grow PPT](#). Have students read [1.2 How Animals Grow Storyline Reading](#) using the [Questions, Connections, Questions Student Reading Strategy](#). See the [Question, Connections, Questions Reading Strategy Educator Resource](#) document for information about how to engage students with this strategy.

- As students read with a partner, have them stop and discuss the italicized questions in the reading with their partner.
- 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 9 of the [1.2 Expressing Ideas and Questions about How Animals 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 10 of the [1.2 Expressing Ideas and Questions about How Animals Grow PPT](#).

- Pass out a [Learning Tracking Tool](#) 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 Animals 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 animal growth, identifying what	We already have some ideas about how a child grows, moves and functions. We also have a lot of questions!	What makes up our food?

		animals need to grow and gain mass.		
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Assessment

Use the student responses to the class discussions and also their ideas on the [1.2 Expressing Ideas and Questions Tool for Animals Growing](#), as well as the [1.2 Assessing the Expressing Ideas and Questions Tool for Animals 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 animals eat, grow, move, and breathe at macroscopic and atomic molecular scales. For now, listen to students' ideas, with attention to how they describe matter and energy. Some students may not use principles of conservation of matter to identify food as the source of mass for animals (and instead only associate food as a source of chemical energy). Students may think that the food disappears as it is eaten and may not recognize that atoms are transferred from the food to the organism for the purpose of growth.

Tips

If you are teaching this to multiple classes, you can save different versions of the PPT, with Slide 6 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 from Systems & Scale 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 misconceptions that may be cultural in nature

Modifications

Extending the Learning

Students can read more about Hans Krebs, whose research in biochemistry was pivotal in a post-World War II society.

- <https://www.nobelprize.org/prizes/medicine/1953/krebs/biographical/>
- <https://academic.oup.com/labmed/article/41/6/377/2657667>