

Category V Life Science Examples

Encouraging students to think about what they've learned

Material A

Consider the following key ideas:

Food provides the molecules that serve as fuel and building material for all organisms. Plants use the energy from light to make sugars from carbon dioxide and water. This food can be used immediately or stored for later use. Organisms that eat plants break down the plant structures to produce the materials and energy they need to survive. Then they are consumed by other organisms. (American Association for the Advancement of Science, 1993)

The first page of a middle school unit that targets these ideas includes three questions that are intended to help teachers find out what their students think (p. [4s](#)). At the end of the chapter, students are asked to review their responses to the questions and revise their ideas based on what they have learned (p. [27st](#)). However, students are not explicitly asked to think about *how* their ideas changed. In addition, only one out of the three questions asked initially (“What is food for plants?”) is relevant for this benchmark.

Connecting to Other Chapters

Chapter 1
investigates the importance of photosynthesis and the plant structures that make it possible.

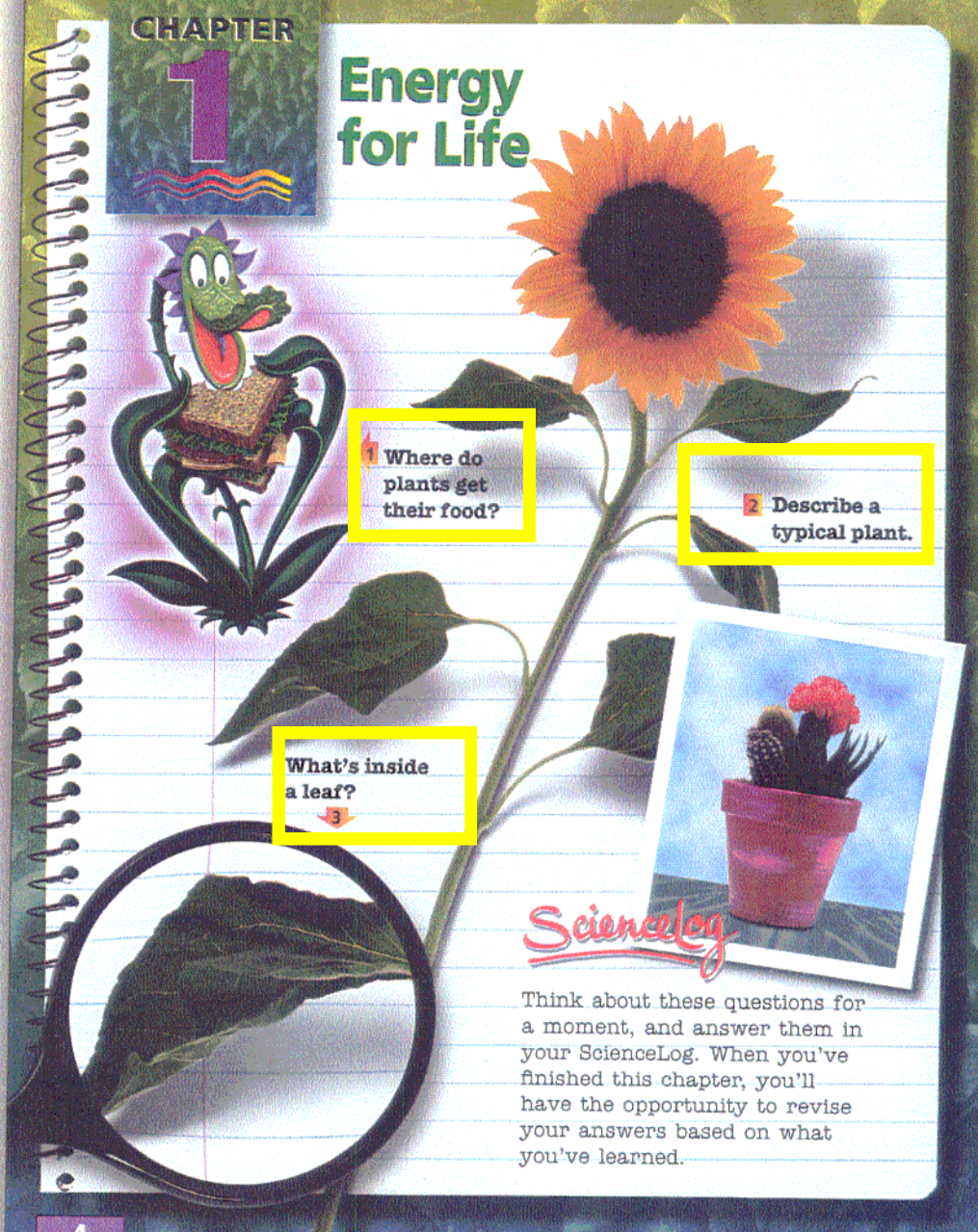
Chapter 2
focuses on water transport, with an emphasis on transpiration, diffusion, osmosis, and cohesion.

Chapter 3
explores how cells turn food into energy through the process of respiration.

Prior Knowledge and Misconceptions

Your students' responses to the ScienceLog questions on this page will reveal the kind of information—and misinformation—they bring to this chapter. Use what you find out about your students' knowledge to choose which chapter concepts and activities to emphasize in your teaching. After students complete the material in this chapter, they will be asked to revise their answers based on what they have learned. Sample revised answers can be found on page 27.

In addition to having your students answer the questions on this page, you may wish to have them complete the following activity: Ask students to make a labeled drawing that represents the process by which plants make food. Ask students to include water, sun, oxygen, carbon dioxide, and any plant structures that they think might be important, so that their drawings are as detailed as possible. Assure the students that there



1 Where do plants get their food?

2 Describe a typical plant.

3 What's inside a leaf?

ScienceLog

Think about these questions for a moment, and answer them in your ScienceLog. When you've finished this chapter, you'll have the opportunity to revise your answers based on what you've learned.

are no right or wrong answers to this question. Collect the papers, but do not grade them. Instead, use the students' drawings to identify possible problem areas in the chapter. Read the papers to find out what students know about life processes, what misconceptions students may have, and what aspects of this topic are interesting to them.

3. Back to the Drawing Board

This chapter began with the question, "How do plants get their food?" Has your thinking changed since then? Here are some suggestions to help you organize your ideas.

- Begin by writing a brief report about how your thinking has changed.
- Look at the poster your group made. Discuss and write comments on the poster.
- Produce a new poster and compare it with the first one.
- Prepare a way to explain to some fifth-grade students how plants get food.

4. Tony's Hypothesis

Your friend Tony (who isn't taking this class) has a hypothesis about the starch in plants. "The starch in plants comes either from the soil they grow in or the water they use," Tony said. "Plants just won't grow where the soil or water isn't starchy." How could you test Tony's hypothesis?

5. The Day the Earth Stood Still

Imagine that you hear the following report on the radio:

Scientists have noticed that plants all over the world are behaving strangely. The leaves of plants fold up when they are in sunlight and they open up in the dark. The stomata of some plants remain shut all day, and then they open at night . . .

Continue this story and describe other behaviors that would be strange for plants. How would other living things be affected by such behaviors?



ScienceLog

Review your responses to the ScienceLog questions on page 4. Then revise your original ideas so that they reflect what you've learned.

ScienceLog

The following are sample revised answers:

- Most plants make their own food. They use energy from light to make sugar from carbon dioxide and water. The sugar is then converted to starch for storage.
- A typical plant has leaves for food production, a stem for transporting water and nutrients and for supporting the leaves, and roots for taking up water and minerals from the soil and for anchoring the plant. Many plants also produce flowers, fruit, and seeds for reproduction.
- A leaf contains a plant's food-making machinery. This includes an epidermis to protect the leaf; palisade cells, where most of the leaf's photosynthesis takes place; rounded, loosely packed cells that provide air space for diffusion of gases and where a lesser amount of photosynthesis takes place; veins that transport water and nutrients to or from the leaf; stomata, which are openings through which carbon dioxide, oxygen, and water vapor enter and exit the leaf; and guard cells that control the opening and closing of the stomata.

- ★ You may wish to provide students with the Chapter 1 Review Worksheet that is available to accompany this Challenge Your Thinking (Teaching Resources, page 19).