



Foundations: Making Content Comprehensible

Introduction


This guide examines features in the 2010 Miller & Levine Biology program that were included to help students increase their comprehension and understanding of key biology concepts. It discusses the features available in the student and teacher editions, in Study Workbook B, and on Biology.com.


The biology content is available through four different versions of the program; however, the Foundations Series has a slightly different set of comprehension tools for struggling readers. Students benefit from the simplified readability of this text. On average, this book is written at a sixth-grade reading level.

Student Edition

Each lesson is introduced with the key questions.

Key Questions

 *What are some of the difficulties a cell faces as it increases in size?*

 *How do asexual and sexual reproduction compare?*

As students read the text, they will see key icons that will lead them to the answers for these Key Questions.

Throughout the textbook, three types of aids assist students in their comprehension:

- Build Understanding
- Build Connections
- Build Vocabulary

The Build Understanding sections provide students with comprehension and organizational tools, such as graphic organizers and learning strategies, to help them organize and categorize chapter information.

Build Connections sections accompany the visual aids located within the lesson. These graphics help students make comprehension connections to relatable analogies. The authors have also included Build Connections as a way to visually summarize a section of text.

Build Vocabulary sections introduce students to new vocabulary words. These words are highlighted. Students are given the definition and are introduced to a word study strategy. The goal of these word study strategies is to build the students' ability to determine the meanings of other unknown words.

Preparing students for reading the text is an important part of ensuring understanding. Begin each chapter with Pre-Reading activities. These help to activate the students' prior knowledge or to set a purpose for the text.

Pre-Reading

Preview the Pages

Point out all the Key Questions and guide students to Build Understanding, Build Connections, and Build Vocabulary features. Remind them that vocabulary is highlighted in the text as well. Tell students that they will be making a T-chart in their Workbooks. Teach

Set the Purpose

Have students survey the title, subheadings, and illustrations. Have students make predictions to the following questions: What is this lesson about? and Why is this important? Ask, What information from the book did you use to predict?

Possible student misconceptions are indicated in the Speed Bump feature. This feature suggests review questions based on what students have just read. Use further discussions and activities to help students clarify their misconceptions.

Speed Bump

- Ask** Can a cell keep growing forever? (no)
- Ask** Why do cells divide? What are the two main reasons? (1. When a cell grows larger, its DNA does not, so the cell ends up making more demands on its DNA. 2. The larger the cell, the harder it is for the cell to exchange food and waste.)
- Ask** In this lesson, what do the ratios compare? (The ratios compare the cell's surface area to its volume.)
- Ask** Is it better for a cell to be smaller in size or larger? Why? (Smaller size is better; a smaller cell can more efficiently exchange materials across cell membrane.)

If students are having difficulties grasping a concept, use the Hands-on Learning Activities that are provided at various places in the chapter.

Hands-on Learning Activity

1. Pair students and hand out the materials. **Materials:** two identical rectangular blocks of wood or small cardboard boxes, masking tape, and metric ruler.
2. **On the board:** What do you think happens to the surface area when the volume doubles? Have students record the question and their answer in their notebooks.
 $a = l \times w = __ \text{ cm}^2$
 $v = l \times w \times h = __ \text{ cm}^3$
3. Explain that area units are centimeters squared; for volume, the units are centimeters cubed. Remind students to find the area of each of the six surfaces, then add them together for the total surface area.
4. Tell students the steps. **Step 1:** Calculate and record the volume and surface area of one block or box. **Step 2:** Write a ratio comparing surface area to volume. **Step 3:** Tape the two objects together and repeat Steps 1 and 2. **Step 4:** Evaluate your findings in your notebook.

Teachers should also use the additional Reading and Learning Strategies that are included in the margins of the teacher's edition. The reading strategy shown here explains how to model self-questioning techniques.

Reading Strategies

SELF-QUESTION Start by pointing out that the surface area is the outside of the cell, it's the membrane; the volume is everything inside the cell. Demonstrate how asking questions helps to clarify new information. Read aloud the first paragraph.

Ask Does this make sense? What does it mean that the cell membrane is not growing as fast as the volume?

Say Sometimes I have to re-read information, and when I do, I can find the answer, like I would if I re-read the 1st sentence on page 216. Have students reread the last sentence on p. 216. (As a cell gets larger, something about the relationship between the cell's volume and its surface area changes. Both the cell volume and membrane grow in size, but not at the same rate. The volume increases way more than the surface area does.)

Ask What does this tell me about the ideal cell size? (The smaller the volume, the more efficient the rate of exchange of materials.)

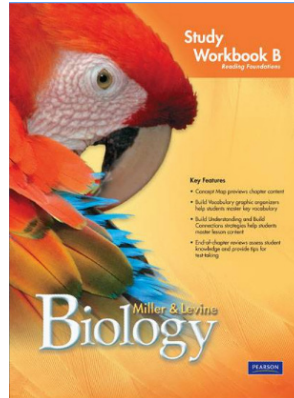
Learning Strategies

MAKING ANALOGIES An analogy is a kind of comparison: It takes two things that seem to be different and shows how they can be similar. Tell students that making analogies can help them learn and remember new information. Encourage them to come up with other analogies to help them make sense of what happens when a cell grows too large.

Ask What happens in a movie theatre filled with people if only one door is open and everyone wants to leave at once

Study Workbook B

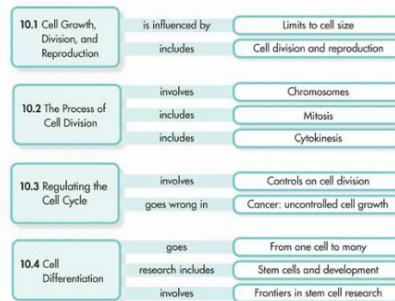
There are two study workbooks available for the Miller & Levine Biology program. Students using the Foundations Series benefit most from using Study Workbook B.



This workbook offers students more support and explicit strategies. It is most often used with struggling readers, ELL students, or students who might just need an increased level of support.

Each chapter is introduced with a chapter summary. The concept map is the students' navigation map through the entire chapter.

Concept Map The concept map below shows what you will read about in this chapter and how the chapter is organized. It shows how several ideas are connected to the main concept. Study the concept map. Then answer the questions that follow.



Throughout each lesson, students are introduced to graphic organizers that assist them in building academic vocabulary and understanding key concepts and processes.

Biology.com

There are many digital tools available on Biology.com that will help build the students' comprehension.

In addition to reading the Chapter Mystery in the textbook, teachers may choose to show students the Chapter Mystery video. Students will benefit from the additional visual and auditory experience.

Biology.com features Untamed Science videos. These videos bring the biology concepts that students are studying to life. The Ecogeeks introduce students to real situations that make the biology concepts concrete and help students increase their understanding.

Other activities help students solidify their understanding of the chapter vocabulary and organize what they have learned.

Review

This guide discussed the features that were designed to help students increase their comprehension and understanding of key biology concepts.

It explained how students make personal connections to the biology material through the narrative text, realistic topics of the Chapter Mysteries, and the three learning aids that are included in the student text. These help students organize and categorize information, make connections to the text through graphics, and alert them to new vocabulary and word study strategies.

The teacher's edition provides additional learning activities that teachers can use to help students increase comprehension.

Additionally, there are a variety of comprehension building activities and videos available on Biology.com.