

Focus Question:

What important lessons have we learned from biomimicry?

Book Summary

Text Type: Nonfiction/Informational

Nature is filled with an amazing array of living things, each with unique designs and behaviors that help it adapt and survive. Humans have much to learn from nature, and the new science of biomimicry helps us copy and apply lessons from nature in our own lives. *Biomimicry* allows students to investigate a variety of examples of biomimicry from Velcro to antireflective computer screens and more. The book can also be used to teach ways to determine the author's point of view and how to correctly use dashes in sentence.

The book and lesson are also available for levels Y and Z1.



Lesson Essentials

Instructional Focus

- ☐ Summarize using textual evidence
- ☐ Determine the author's point of view
- ☐ Locate information using the table of contents
- ☐ Determine the correct usage of dashes in sentences
- ☐ Identify root words and affixes

Materials

- ☐ Book: *Biomimicry* (copy for each student)
- ☐ Summarize, dashes, root words worksheets
- ☐ Discussion cards
- ☐ Book quiz
- ☐ Retelling rubric

Vocabulary

Boldface vocabulary words also appear in a pre-made lesson for this title on VocabularyA-Z.com.

• Words to Know

Story critical: *adaptations* (adj.), *ecological* (adj.), *ecosystems* (n.), *exploit* (v.), *resources* (n.), *sustainable* (adj.)

Enrichment: *contaminating* (v.), *dispersal* (n.), *inhabitants* (n.), *microbes* (n.), *microscopic* (adj.), *pigment* (n.), *Renaissance* (n.), *silica* (n.), *spew* (v.)

- **Academic vocabulary:** *cause* (v.), *complex* (adj.), *discover* (v.), *energy* (n.), *environment* (n.), *same* (adj.)

Guiding the Reading

Before Reading

Build Background

- Write the word *mimic* on the board and ask students to describe the meaning of the word or to give a synonym. Then write the prefix *bio-* on the board and have students discuss the meaning. Next, show students the cover of the book and read the title aloud. Ask students to predict what *biomimicry* means.
- If possible, show students pieces of Velcro. Ask students to explain how Velcro works and where they think the idea came from. Explain that the design for Velcro came from nature and they will read about Velcro and other examples of biomimicry in this book.

Introduce the Book

- Give students their copy of *Biomimicry*. Guide them to the front and back covers and read the title. Have students discuss what they see on the covers. Encourage them to offer ideas as to what type of book it is (genre, text type, and so on) and what it might be about.
- Show students the title page. Discuss the information on the page (title of book, author's name).
- Preview the table of contents on page 3. Remind students that the table of contents provides an overview of the book. Ask students what they expect to read about in the book, on the basis of what they see in the table of contents. (Accept all answers that students can justify.)

Introduce the Reading Strategy: Summarize

- Explain to students that engaged readers summarize, or create a brief overview, as they read. Ask students to preview the book, looking at photos, captions, and other text features. Explain to students that when readers summarize what they read, it helps them remember information in the section or book. Point out that a summary often answers the questions *who*, *what*, *when*, *where*, and *why*. Create a chart on the board with the headings *Who*, *What*, *When*, *Where*, and *Why*. Read page 4 aloud to students and model summarizing the information you just read.

Guiding the Reading (cont.)

- Give students strips of paper with the following sentences written on them: *Biomimicry is the science of mimicking an organism's adaptations. It involves copying its adaptations to benefit humans and help them solve problems. Other living things are not harmed during biomimicry, only observed to understand their behaviors.* Ask students to organize the sentences into the headings on the board and identify which section from page 5 is being summarized.

Introduce the Comprehension Skill:

Author's point of view

- Explain to students that when authors write about a topic, they often express their attitude and opinion about the subject. This is called the *author's point of view*. The author's point of view is often expressed through his or her purpose for writing—to inform, to persuade, or to entertain. Point out that, while a nonfiction book's purpose is usually to inform, we can often infer how the author feels about the topic from the details included in the book.
- Explain to students that as they read the book, they will be looking for details that show the author's point of view.

Vocabulary

Have students turn to the "Words to Know" box on the copyright page. Discuss each word with students. Then, have students turn to the glossary on page 23. Explain that the glossary provides definitions for the vocabulary words in the book. Point out the use of each content word and academic vocabulary word in the book, and then use each word in a different model sentence. Have students work in groups to create posters for these words. Have them include on each poster the word and its part of speech, the definition, the word in an example sentence, and a picture illustrating the meaning of the word.

Set the Purpose

- Have students read to find out more about how humans mimic nature to improve their lives. Write the Focus Question on the board. Invite students to look for evidence in the book to support their answer.
- Have students make a small question mark in their book beside any word they do not understand or cannot pronounce. These can be addressed in a future discussion.

During Reading

Text-Dependent Questions

As students read the book, monitor their understanding with the following questions. Encourage students to support their answers by citing evidence from the book.

- How are biomimicry and reverse engineering connected? (level 2) page 5
- How are a cat's eyes and a moth's eyes different or similar? (level 2) pages 8 and 9
- How do termites cool their homes? (level 1) page 13
- How would you organize the types of biomimicry used in the book? (level 2) multiple pages
- Would you argue that scientists use animal life or plant life more often as examples of biomimicry? (level 3) multiple pages
- How important is biomimicry to our own survival? Use evidence from the text to support your rationale. (level 3) multiple pages
- Using information from this book and other resources, write a short paragraph to persuade someone to use biomimicry in place of technologies that are currently used. (level 4) multiple pages

Text Features: Table of contents

Explain that the table of contents is a list of the sections in the book. It can be used to find information quickly and is located at the front of every book. Have students turn to page 3 of the book. Ask students what they can expect to read about in this book. Have students work with a partner to predict what each section might contain. Ask students: *In what section might I learn about how a specific animal does something that scientists mimic? On what page does that section begin?* Have students turn to page 7 and confirm that the author begins explaining specific animals and how biomimicry is used. Continue to ask students about information from the table of contents and which pages they will find the information on as needed.

Skill Review

- Review how to summarize with students. Have students turn to page 7. Ask students to list the *who, what, when, why, and how* information from the section with a partner. Have partners then tell each other a short summary of the section. Invite volunteers to share their summaries with the class.
- Model how to complete the [summarize worksheet](#).
- Review with students that an author of a nonfiction book often expresses his or her point of view while writing. Have students turn to page 4 and read the second paragraph.
- Model evaluating details to determine the author's point of view.
Think-aloud: *I know that authors include details in their writing that reflect their beliefs or feelings about a topic. When I read, I can look for details that the author includes to make a point about the subject. For example, the author says on page 4 that we can apply lessons from nature to our own lives. This detail leads me to believe that the author has a strong respect for the abilities of plants and animals, and believes people can learn a lot from them.*

Guiding the Reading (cont.)

- Explain to students that one way to get to know an author's viewpoint is to interview him or her. Ask students what kinds of questions they could ask the author to understand his point of view on biomimicry. Write suggested questions on the board. Direct students to questions such as the following: *What makes biomimicry an important science? How can people benefit from biomimicry? How does the Earth benefit from biomimicry? What mistakes do you feel people have made while developing new technologies?* Ask students to work with a partner to answer these types of questions with evidence from the text. Discuss textual evidence with the class. Together, formulate what the class agrees to be the author's point of view.

After Reading

Ask students what words, if any, they marked in their book. Use this opportunity to model how they can read these words using decoding strategies and context clues.

Skill Review

Worksheet: Summarize

Review the summarize worksheet that students completed. Have students share their work in groups.

Comprehension Extension

Discussion cards covering comprehension skills and strategies not explicitly taught with the book are provided for extension activities.

Response to Focus Question

Have students cite specific evidence from the book to answer the Focus Question. (Answers will vary. Reasons should include the following: *Scientists have studied animals and plants to help make life for humans easier. They have found that if we mimic, or copy, natural occurrences, we create less waste while still improving our lives.*)

Comprehension Checks

- **Book quiz**
- **Retelling rubric**

Book Extension Activities

Build Skills

Grammar and Mechanics: Dashes

- Explain to students that a dash (—) is a punctuation mark that can be used for different purposes: to show an afterthought or summary at the end of a sentence or to “set off” or clarify information within a sentence.
- Write the following sentences on the board: *The important part to remember is that biomimicry doesn't use living things—it learns from them. Leonardo da Vinci designed many flying machines*

based upon his observations of birds—though none of those machines actually worked.

- Explain that in these sentences, the dash is being used to add a thought or more information to the end of the sentence. Ask students to identify which sentence adds a thought. Review or explain the difference between a dash and a hyphen: hyphens are used in compound adjectives, adverbs, and nouns such as *well-known scientist* and *high-speed train*. Point out that hyphens are shorter in length and are used to connect two or more words. Remind students not to confuse a dash with a hyphen.
- **Check for understanding:** Have students turn to page 10 and circle or highlight the sentence containing the dash. Ask a volunteer to explain how the dash is used (to add more information about the surface of a lotus leaf).
- **Independent practice:** Introduce, explain, and have students complete the **dashes worksheet**. Allow students to check their work using the book. If time allows, discuss their answers.

Word Work: Root words

- Explain to students that a *root word* is the smallest part of a word that can stand alone as a separate word. The root word can often help the reader identify or infer the meaning of a longer word. Write the word *adapt* on the board. Then write *adapted* and *adaptation*.
- Explain or review that *prefixes* and *suffixes* are syllables, or groups of letters, added to the beginning or end of a word to alter or change its meaning or its verb tense. Highlight the examples of suffixes on the words on the board (*-ed* and *-ation*). Explain how *-ed* changed the verb tense of *adapt* from present to past tense and *-ation* changed the word from a verb to a noun.
- Write the word *inventor* on the board. Ask students what the root word is, and write *invent* under the word *inventor*. Discuss how prefixes and suffixes often have a meaning of their own.
- **Check for understanding:** Have students turn to page 8 and find and highlight the words *reflected*, *reflectors*, and *reflective*. Ask them to identify the root word (*reflect*). Ask a volunteer to look up *reflect* in the dictionary and read aloud its meaning and part of speech. Ask other volunteers to identify the part of speech of each of the other words, its prefix or suffix, and what the word might mean, on the basis of the meaning of *reflect*.
- **Independent practice:** Introduce, explain, and have students complete the **root words worksheet**. Discuss their answers aloud after they are finished.

Connections

- See the back of the book for cross-curricular extension ideas.