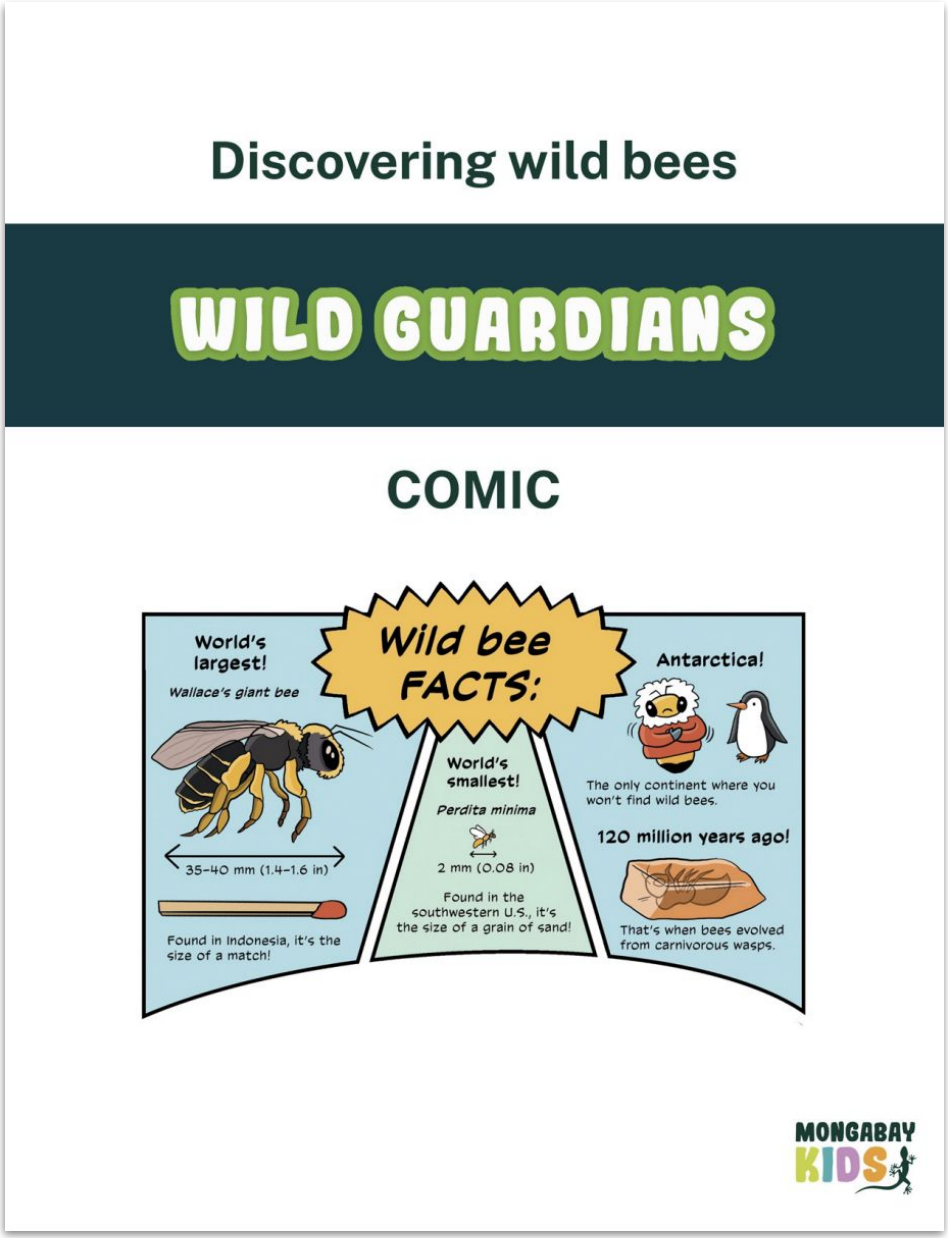
Teacher edition



Written by Emily Townsend

Teacher edition

This guide accompanies the Mongabay Kids Wild Guardians comic, "Discovering wild bees." (Print version, low resolution version.)
A video with accompanying guide and lessons that align with grades 4–5 content and standards are found here.
Preview the guide **before** reading with students, and mark stopping points that are most appropriate for your students based on grade level, content and background knowledge. You do not need to use all the stopping points when reading the text, they are suggestions.

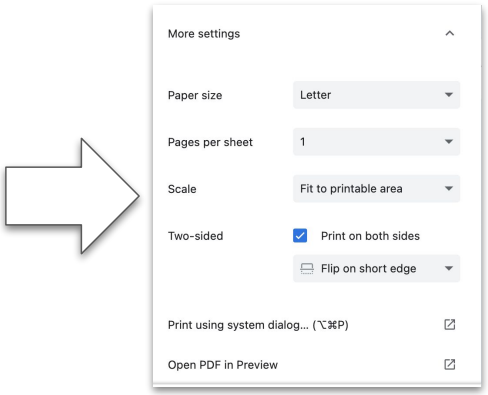
Planning with the guide

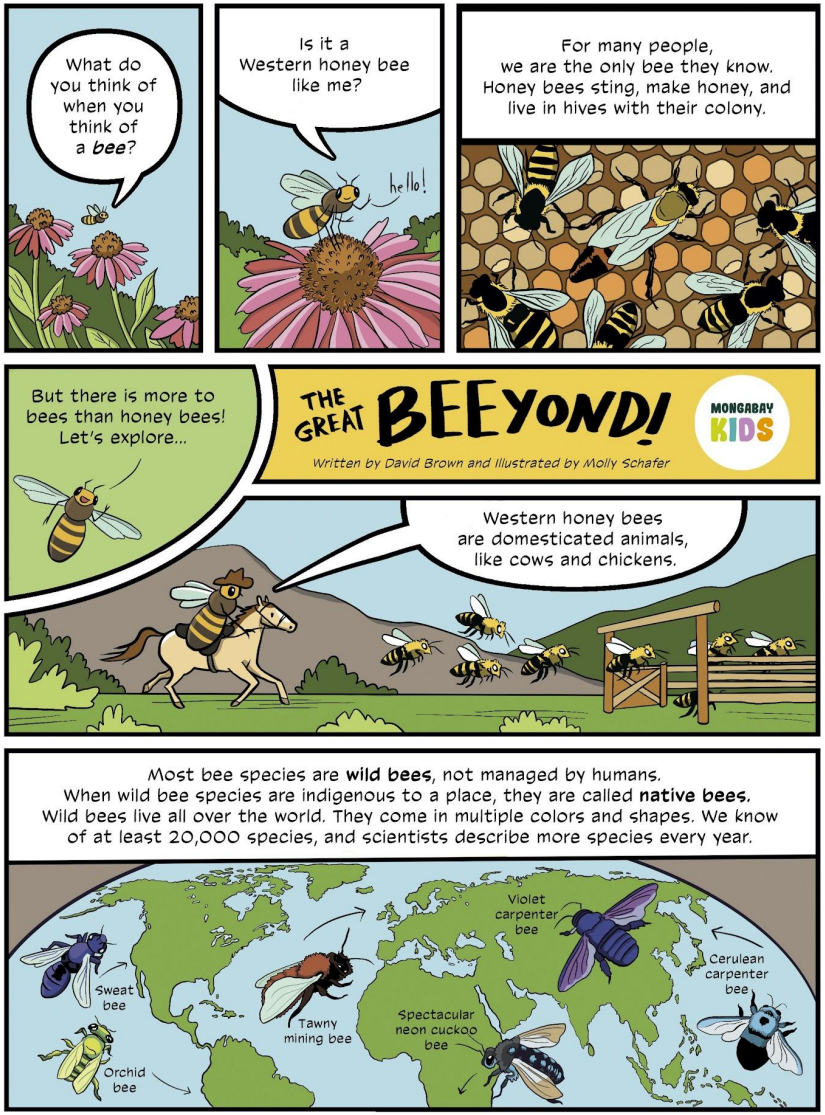
There is some white space throughout the teacher guide for your note-taking and planning purposes.

Printing the guide

The guide is designed to be printed on 11x17 inch paper (or A3 paper). It can be printed double sided; flip on the short edge. Do not fold it like a book. Staple on the short edge.
If you cannot print on 11x17, you can use your printer settings to print on 8.5x11 inch (letter) paper (or A4 paper). It can be printed double sided. Do not fold it like a book. Staple on the short edge.

Sample printer settings to print on 8.5x11 inch paper





Science

Animal adaptations

Make predictions about the bees in the bottom panel on the map, based on their names. *What may a carpenter bee do? A mining bee?*

Next, consider the bees' wings, antennae, and body shapes, making predictions as to how these structures may support bees to survive.

Standard connection: 4-LS1-1

Language arts

Comma usage

Circle comma usage on this page. Students practice reading with appropriate pausing and discuss the author's purpose in using commas, including a list (top left) and to set off an introductory element (top left, bottom).

Standards connection: CCSS.ELA-Literacy.L.5.2.a, b

Other

Math connection

The text states that there are "... at least 20,000 species ..." Discuss if this quantifier means there are "more than" or "less than" 20,000. Then, students consider why the author would choose to round the number in this context *(vs. using an exact count).*

Standards connection: CCSS.Math.4.NBTA.2, 3

Science

Confirm predictions

Confirm or revise students' predictions about the types of bees named on page 1. Note the variety of behavior tactics solitary bees employ to survive.

Language arts

Vocabulary: Word parts

Break apart the word *"domes/ticat/ed"* into word parts. Discuss meanings of each part, then put the meanings together to define the word *(domes = home, ate = verb, ed = adjective)*. Make connections to other words students know, *e.g. domestic, domicile,* and words that use 'ed' in an adjective *e.g. excited, embarrassed.*

Standards connection: CCSS.ELA-Literacy.L.4.4.b/5.4b

Make inferences: Interpret visual information

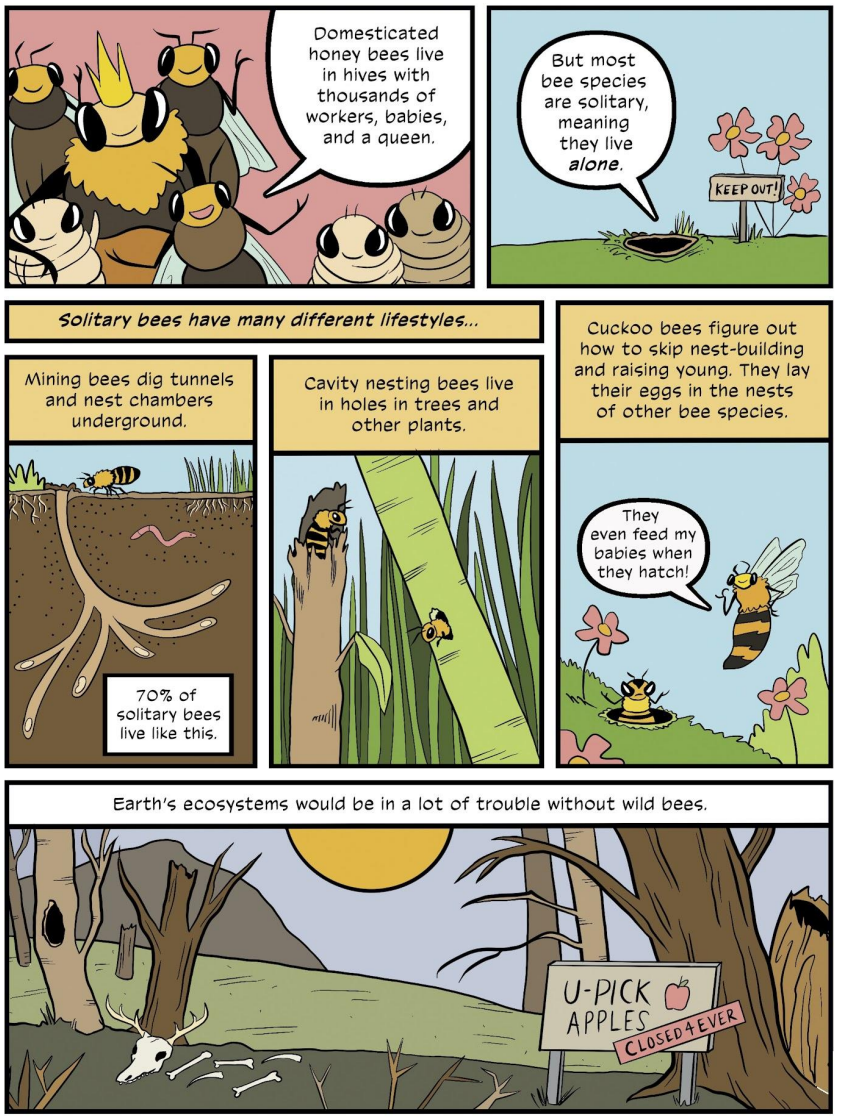
Reread the statement in the bottom panel. Ask students to describe the accompanying image. Then, make inferences using both visual and written information to summarize the point the author is making on this page. (Ecosystems rely on wild bees, including our food supply.)

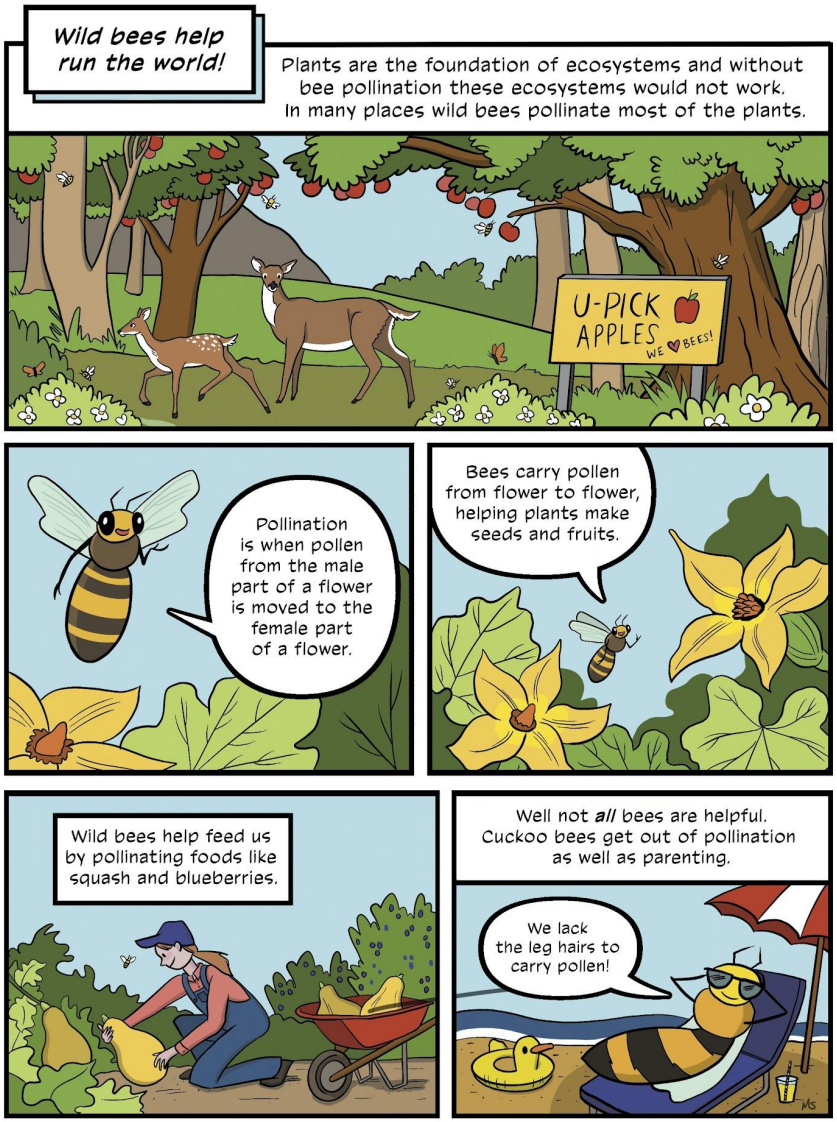
Standards connection: CCSS.ELA-Literacy.RI.4.7/5.7

Other

Text type: Reading a comic

Comics are written using clues for the reader. Students look for clues in how to sequence the page, color cues, and word bubbles vs. insets. Discuss the author's choices in sharing information throughout the text using different strategies.





Science

Crosscutting concepts: Systems and systems models

Discuss how wild bees are a part of the ecosystem and how different components (flowers, bees, people) interact.

Summarize and paraphrase

Turn and talk to describe the pollination process and wild bees' role in making food.

Language arts

Vocabulary: Word parts

Reread to find all derivatives of "pollen". Discuss the suffixes that change the part of speech.

- Pollin**ate** = simple present tense verb
- Pollina**tion** = noun
- Pollinat**ing** = present progressive verb

Standards connection: CCSS.ELA-Literacy.L.4.4.b/5.4b

Other

Text to self connection

Discuss your favorite fruits (and vegetables) that are pollinated by wild bees and other insects. *(Many culinary vegetables are actually fruits! Fruits are technically any produce with a seed, but some common fruits like cucumbers and tomatoes are often called vegetables.)*

Science

Protecting the Earth

How can your community support wild bees? Choose one way to "Be a wild bee guardian" and make a plan with your class to implement it. Check out the Wild Guardians lesson: "Action in my community" for step by step directions.

Standard connection: NGSS 5-ESS3-1

Language arts

Determining main idea

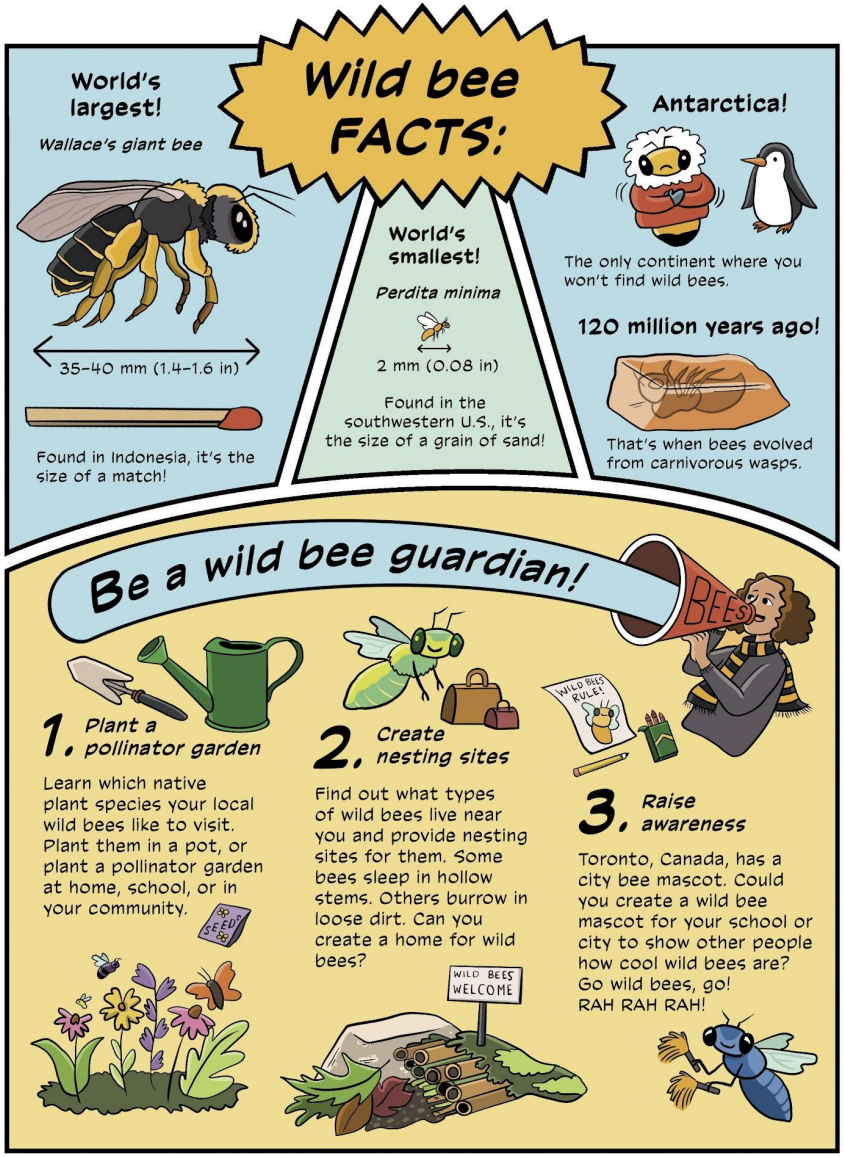
Discuss the three different short texts in the comic. What do you think is the main idea of each text? What about the comic as a whole?

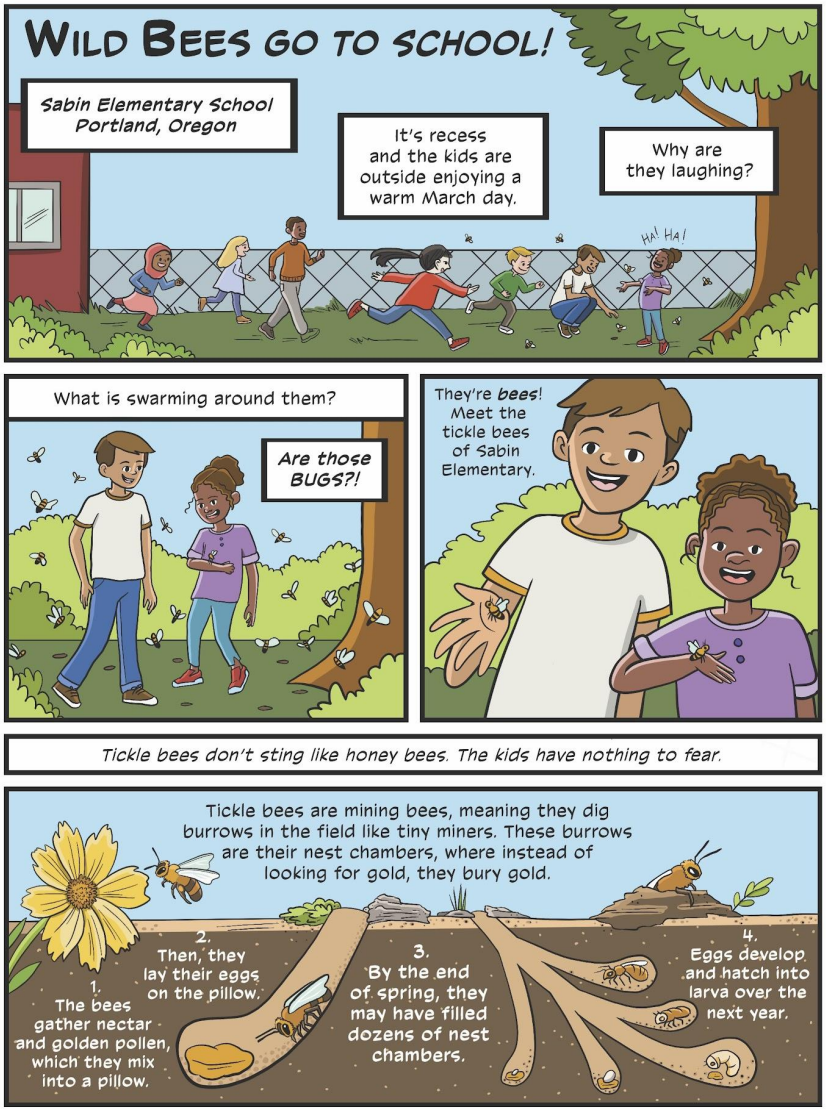
Standards connection: CCSS.ELA-Literacy.RI.4.2/5.2

Math

Comparing numbers

How much larger is Wallace's giant bee than the smallest bee, *Perdita minima*? What is a wild bee in your area? How does its average size compare?





Science

Comparing animal adaptations

Discuss why mining bees don't use their stingers like honey bees. Consider differences in social behavior while reading the next two pages to add to your understanding. *(Answer: Only female bees have stingers, which are modified ovipositors that double as the egg-laying structure. Honey bees are social and live in colonies with many resources to protect. Female worker bees can lay unfertilized eggs, but mostly use their stingers to help defend the colony. Their stingers are barbed and get stuck when they sting, so they die when they use it. In contrast, mining bees are solitary and do not have barbed stingers. Female mining bees are not aggressive and rarely sting people unless threatened. Male bees do not have ovipositors and therefore can't sting).*

Standard connection: NGSS 4-LS1-1

Language arts

Figurative language

The bottom panel says, "These burrows are their nest chambers, where instead of looking for gold, they are burying gold." What does the author mean by the two different references to gold? How does gold connect to mining bees?

Standards connection: CCSS.ELA-Literacy.L.4.5, 5.5

Other

Sequencing

Students begin to draw a cycle showing a year in the life of Sabin Elementary and the mining bees. Continue the sketch on the next page.

Science

Wild Guardian models

How does Sabin Elementary and the surrounding community help the tickle bees? How do the wild bees support the community?

Standard connection: NGSS 5-ESS3-1

Making connections: Oviparous animals

How do the tickle bees care for their young? How does this compare to other animals you know who lay eggs?

Language arts

Gathering evidence

Why do you think Sabin Elementary adopted the tickle bees as their mascot? Support your reasoning with evidence from the text.

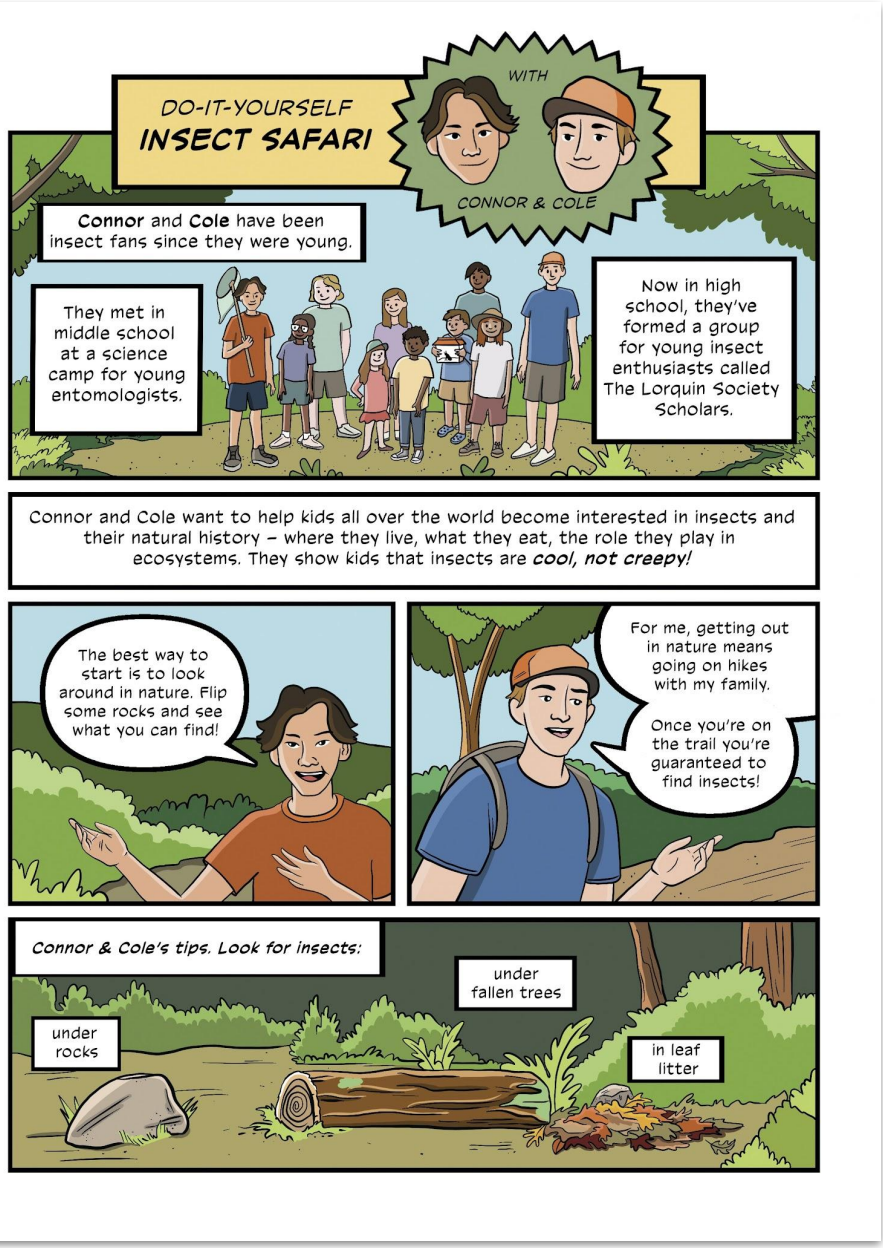
Math

Impact estimation

Panel 2 tells us there are thousands of tickle bees at Sabin Elementary. Each mining bee can pollinate up to a thousand flowers in their lifetime. For each thousand bees that emerge each spring, about how many flowers may be pollinated in Portland, OR?

Standard connection: CCSS. Math. 5.NBT.B.5





Science

Asking questions and defining problems

What questions do you have about insects?

Language arts

Vocabulary: Word parts

Break apart the word *"entom/olog/ist"* into word parts. Discuss meanings of each part, then put the meanings together to define the word *(entom = insect; logos = study of; ist = person who)*. Make connections to other scientists students know, *e.g. biologist, ecologist, geologist, etc.*
Standards connection: CCSS.ELA-Literacy.L.4.4.b/5.4b

Other

Text to self connection

Connor and Cole started the Lorquin Society Scholars to teach people that insects are "... cool, not creepy!" Share your feelings about insects and why you feel that way. Consider if personal experiences, media, or other factors influence your opinion. If students bring up being scared of bees, encourage them to check out this post.

Science

Correcting misconceptions

All moths and butterflies have a four-stage life cycle: egg, larva (caterpillar), pupa, and adult. People often use the word "cocoon" to describe the pupal stage of a butterfly. However, the correct term for a butterfly pupa is "chrysalis." Inside the chrysalis, the butterfly undergoes metamorphosis. A cocoon is a protective silk casing that some, but not all, moth caterpillars spin around their pupa.

Crosscutting concept: Patterns

Activate student background knowledge about insect life cycles and classify the examples shared by Cole.

- egg: ladybug eggs
- larva: ladybug larvae, caterpillars
- pupa: chrysalises
- adult: praying mantids

Language arts

Language: Plurals

Cole shares about what he finds under leaves. Note the plural forms of the different insects and discuss rules:

- **s:** caterpillars, eggs, praying mantids *(most nouns)*
- **es:** chrysalises *(nouns ending in s, ch, sh, x, or z)*
- **irregular:** larvae *(Latin root)*

Other

Identification tools

Connor and Cole use iNaturalist and field guides to learn about insects and identify them. Ask students about their experiences with these or other tools, like Seek by iNaturalist. If possible, share how to use these or other tools to identify animals and plants.



Mongabay Kids is the Kids Desk of Mongabay, a nonprofit environmental science and conservation news platform.

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Website: kids.mongabay.com