Thank Goodness for Bees

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CONNECTED
SCIENCE • TECHNOLOGY • MATHEMATICS
2012 LEVEL 2

Overview

"Thank Goodness for Bees" explains how honey bees differ from similar insects. It describes how honey bees have adapted to be able to collect nectar and pollen from flowering plants and how they turn the nectar into honey. It also explains how bees produce wax to construct honeycomb to store their honey.

Curriculum context

SCIENCE

NATURE OF SCIENCE

Investigating in science

Achievement objective(s)

L1 and 2: Students will extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

Communicating in science

Achievement objective(s)

L1 and 2: Students will build their language and develop their understandings of the many ways the natural world can be represented.

LIVING WORLD

Life processes

Achievement objective(s)

L1 and 2: Students will recognise that all living things have certain requirements so they can stay alive.

Ecology

Achievement objective(s)

L1 and 2: Students will recognise that living things are suited to their particular habitat.

Evolution

Achievement objective(s)

L1 and 2: Students will recognise that there are lots of different living things in the world and that they can be grouped in different ways.

Key ideas

- The honey bee is a living thing. All living things have seven life processes.
- Over time, the honey bee has evolved structures and processes to locate, gather, process, and store food.
- Living things and their environment are interdependent.
- Bees survive in an environment that contains flowering plants, which are also living things.
- Each species has specific structures with specific functions that contribute to the survival of that species.

MATHEMATICS

NUMBER AND ALGEBRA

Number strategies

Achievement objective(s)

L2: Students will use simple additive strategies with whole numbers and fractions.

Number knowledge

Achievement objective(s)

L2: Students will know the basic addition and subtraction facts.

Key ideas

- Organising information can make it easier to solve word problems.
- An average shows where the middle of a data set lies.

ENGLISH

READING

Ideas

Achievement objective(s)

L2: Students will show some understanding of ideas within, across, and beyond texts.

Indicators

- Uses their personal experience and world and literacy knowledge to make meaning from texts.
- Makes meaning of increasingly complex texts by identifying main ideas.
- Makes and supports inferences from texts with some independence.

The Literacy Learning Progressions

The literacy knowledge, skills, and attitudes that students need to draw on by the end of year 4 are described in *The Literacy Learning Progressions*.

Meeting the literacy challenges

The following strategies will support students as they engage with the information and ideas in the text. Once they understand what the article is about ("the story"), they will be able to explore the key science ideas outlined in the following pages.

The *Connected* series includes a range of texts that provide opportunities for students to locate, evaluate, integrate, and synthesise information and ideas.

It is expected that students will read across the range of texts in this *Connected* to develop their literacy skills and their understanding of the topic.

Text characteristics

- Lengthy text with headings that signal the information on each page and that support the reader in locating specific information
- Competing information that shifts the focus and adds interest
- Many subject-specific words with their meanings explained in the running text
- Conversational tone that helps the reader to visualise information and that includes the use of idiom.

1. FINDING THE INFORMATION IN THE TEXT

This article begins with a short paragraph on page 2 that states the writer's opinion (that man's best friend is the honey bee). The article then goes on to provide information about bees that supports the writer's viewpoint.

- Bees are vegetarians. They don't prey on other creatures or on humans.
- Bees make honey.
- Bees actively work as a team to support their hive.
- Bees pollinate crops.
- Bees make beeswax.

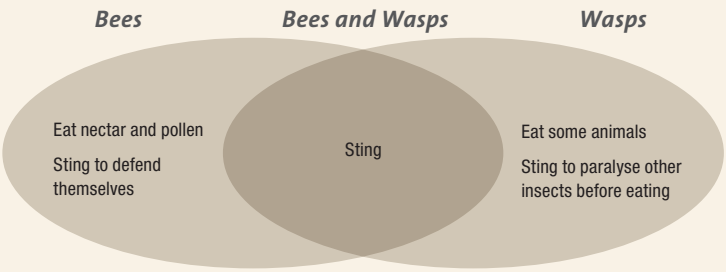
IDENTIFY aspects of the structure, such as title, headings, sections, and diagrams, that will help your students to navigate the article and locate the main ideas. Support the students to make predictions about the key ideas and information from skimming through the text.

PROMPT the students to **RECORD** information that supports the writer's viewpoint as they read through the text.

ASK QUESTIONS to stimulate the students' interest and to scaffold their making connections between the information about bees and the competing information about other animals.

Why does the writer tell us about the differences between bees and wasps? Why does she write about ants? (Because they all belong to the same family. Because many people can't distinguish between bees and wasps.)

Create Venn diagrams, where students can **RECORD** the similarities and differences between bees and wasps and between honey bees and bumble bees. For example:



Have the students **SUMMARISE** the main points under each heading. In pairs, have them discuss the information in each section and ask them to identify the main points in their own words.

2. DEALING WITH UNFAMILIAR VOCABULARY

EXPLAIN to the students that many words in this text may be unfamiliar to them. **PROMPT** them to read on for a sentence or two when they first encounter an unfamiliar word.

You might not be sure about that word "membrane", but read on until you find some words that explain what it means.

What's the word that the writer uses to describe a plant-eater?

MODEL "reading around" unfamiliar words to gain meaning from context.

If they feed the larvae and the queen, what do you suppose the "larvae" might be?

Well, if vibrating their muscles warms up the hive, I'm predicting that "vibrating" means moving them in some way.

"Imported" is placed just before "bees" so "imported" must be an adjective. It must mean a certain sort of bee. It's not a native bee, so it's a different sort. Does the heading give us a clue?

The students can **IDENTIFY** and **RECORD** vocabulary that is new to them in the article and compile their own glossaries, adding meanings in their own words, for example:

thorax – the middle part of the bee's body between the head and the abdomen
solitary – living alone
social – living in a colony

EXPLAIN that some words have a special scientific meaning that is different from the common meaning for the word.

Students can highlight the words in their glossaries that are scientific words. As an extension activity, they can use dictionaries to find the common meanings of these words.

Develop a class chart of useful strategies for working out unfamiliar vocabulary.

3. DEALING WITH IDIOMS

In this article and throughout the book, the writers have enjoyed using a number of idioms that relate to bees. Idioms are expressions with meanings that the words alone don't convey. These expressions are often used in informal language.

Many students will be unfamiliar with these expressions. **IDENTIFY** them and **PROMPT** the students to discuss what they might mean. If they have difficulty inferring the meaning from the context, give them some additional clues.

Mind your own beeswax – it's not your business.

Ms Wynn in the office is always as busy as a bee.

Encourage the students to make up sentences using these expressions.

There are a great many idioms about bees and beehives. Students can discuss bee idioms with their families or search the Internet and list those they discover.

IDENTIFY and discuss the idiom in the opening text of this article.

(Man's best friend is the dog.)

Exploring the science

The following activities and suggestions are designed as guide for supporting students to explore and develop scientific explanations of natural phenomena within the living world.

Key ideas

- The honey bee is a living thing. All living things have seven life processes.
- Over time, the honey bee has evolved structures and processes to locate, gather, process, and store food.
- Living things and their environment are interdependent.
- Bees survive in an environment that contains flowering plants, which are also living things.
- Each species has specific structures with specific functions that contribute to the survival of that species.

Activity 1: *Defining the honey bee as a living thing*

Explain that scientists classify plants and animals as living things.

Living things need to carry out seven life processes: to move, to reproduce, to sense what is around them, to grow, to respire, to eat, and to excrete.

Human beings and honey bees are both living things.

Prepare a chart on a whiteboard and ask the students in small groups to record and compare how humans and honey bees carry out the seven life processes. Encourage the students to scan the article to locate relevant information.

Life process	Humans	Honey bees
Move		
Reproduce		
Sense what is around them		
Grow		
Respire		
Eat		
Excrete		

Activity 2: *Exploring the structure of bees, wasps, and ants*

Explain that scientists classify bees, wasps, and ants as insects. Insects are the largest group of animals. Their bodies consist of three parts – the head, the thorax, and the abdomen. The thorax carries three pairs of legs and usually one or two pairs of wings. The body is generally encased in a tough, semi-transparent, protective outer cover called chitin.

The students, working individually, in pairs, or in small groups, can design and make a model of a bee, a wasp, or an ant using craft material. Their insect must be anatomically accurate. When completed, the students can make labels for the parts of the insect and attach these to their models.

Extension activity

Explain that as the bee evolved into a herbivore (see page 3 of "Thank Goodness for Bees"), its mouthparts changed. Bees with longer tongues were more successful in collecting nectar, increasing their chances of survival.

Using craft materials including plastic straws, the students can make models of a specialised tongue that could be used to extract a material like nectar from difficult sites. Prompt the students to use appropriate scientific vocabulary to explain how their model works.

Activity 3: *Surveying the local community to locate honey bees at work*

The students can design a survey form to record their sightings of honey bees. The form should include details such as location, time of day, and types of plants where bees were observed. As a class or in small groups, the students can take walks to collect data for their surveys. They may need to use reference books to identify plants.

Time	Place	Plants
9.45 a.m.	outside bike sheds	mānuka bush
9.50 a.m.	Blacks' vegie garden	borage
3.15 p.m.	at bus stop	dandelions

Activity 4: *Writing job descriptions for bees*

Have the students view videos and read the text from "Thank Goodness for Bees" to identify the different activities bees do when collecting nectar and pollen and working within the hive. They can then write a job description for bees, including the tasks for each activity.

Activity 5: *Investigating insect constructions*

Honey bees make honeycomb out of a wax they make from pollen – they "sweat" the wax from a gland. Have the students work in groups to research how mason bees and paper wasps make nests. They could use their research findings to model these processes.

Activity 6: *Testing our thinking*

Have the students discuss what they have learnt from their reading and the activities above. Individually or in groups, they can then choose an aspect of the life of the honey bee to investigate further.

Their investigations may:

- answer questions
- fill gaps in their knowledge and understanding
- provide evidence to confirm generalisations they have made.

A useful framework for investigating in science is detailed on pages 13–15 in *Making Better Sense of the Physical World*. Your school's inquiry framework could also inform this activity.

[If students are not confident about what a science investigation looks like, "A Sprinkle Here, a Sprinkle There", in *Connected* 1 2004, pages 22–25, provides a clear account of a student planning and carrying out a scientific investigation.]

MINISTRY OF EDUCATION RESOURCES

- Building Science Concepts (BSC series): Book 39: *Is This an Animal?*; Book 4: *Animal Life Histories*; Book 35: *Is This a Plant?*; Book 25: *Flowers, Fruits, and Seeds*; Book 26: *Making New Plants*
- *Making Better Sense of the Living World* (2001)
- Ready to Read series (orange level), *Honeymakers*
- *Junior Journal* 36, "Dancing Bees"
- *School Journal*, Part 2 No. 4, 2000, "Making Honey"
- For appropriate tasks, see the Assessment Resource Banks site and linking documents to the Making Better Sense books and the BSC series:
  - http://arb.nzcer.org.nz/resources/science/bsc.php
  - http://arb.nzcer.org.nz/resources/science/bettersense/

FURTHER RESOURCES

- See also the resource lists in the BSC and Making Better Sense books
- www.honeycouncil.ca/index.php/canadianhoney_resources

Exploring the mathematics

Busy Bees! presents students with a range of facts related to honey production in a worker bee's lifespan. Students can use the information in the text to solve problems and are presented with a challenge that requires them to use almost all the number-related facts in the text. This activity provides good opportunities for mathematical discussion, particularly around number strategies.

Key ideas

- Organising information can make it easier to solve word problems.
- An average shows where the middle of a data set lies.

Activity 1: *Exploring word problems*

Word problems involve selecting information from text and working out how to use the information to solve a problem. This is a process many students find challenging, and solving word problems should be viewed as a skill in its own right.

Busy Bees! presents several number-related facts. Have the students list the number-related facts, setting them out for later reference, for example, 1 lifespan = 6 weeks, honey in one lifespan = 1/12 teaspoon, trips per day = 10, and so on.

Organising the information in this way helps students to become familiar with the information provided and allows them to consult their list rather than returning to the text each time they work on a problem.

Ask questions to identify the competing information in the text. This is the information that is not directly relevant to the mathematical problems.

What information in the text are we not likely to use to solve these problems? (Examples are: New Zealanders have one of the highest honey-eating rates in the world, and a worker bee doesn't sleep.) For students who find word problems challenging, prompt them to identify the information in the text that is useful for each question by identifying language clues.

This question asks us how many bee-lives it takes to make a teaspoon of honey. Let's check all the places in the text where the words "a teaspoon of honey" crop up, and then we'll check to see if that bit of information can help us solve the problem.

Activity 2: *Exploring mathematical language*

Have the students identify mathematical language in the text. For example, the text states that the average lifespan of a worker bee is 6 weeks. (Check that they understand the meaning of "lifespan".)

Students work with averages more formally at curriculum level 3, but it is useful to discuss the term at curriculum level 2. Explain that in everyday use, the word "average" means normal or usual. Its meaning in mathematics is more specific: an average shows where the centre of a group of data lies.

Ask the students to look for other information about averages in the text.

Explain that averages don't tell us how spread out a data set is. Some bees live longer than 6 weeks and some not as long, but we don't know how long they can live. The text doesn't tell us the maximum distance a bee can fly.

Ask the students to predict how long a bee *might* be able to live and how far they *might* fly on a trip.

Explain that although averages don't tell us about spread, we can make some inferences from them: it seems possible that a worker bee might live for 7 weeks; it seems unlikely that a worker bee will live for 2 years.

Ask questions to prompt their understanding. *A bee visits 50–100 flowers on each trip. What might the average number of visits be?*

Why might it be useful to work with a single number rather than with a range of numbers? [This may become evident to the students when they tackle the word problems, especially the Super Challenge].

Students can use additive strategies to solve each problem, although the problems can be solved more efficiently by using multiplication.

Answers to the Busy Bees! problems

Bee-lives to make 1 teaspoon of honey: 12
Trips in a week: 70
Trips in a lifetime: 420
Distance in a day: 20 km
Distance in a week: 140 km
Distance in a bee-life: 840 km
Flowers in a day: 500–1000
Flowers in a week: 3500–7000
Flowers in a lifetime: 21 000–42 000.

Activity 3: *Exploring the Super Challenge*

The size of the numbers in this challenge is suitable for students moving beyond curriculum level 2.

The Super Challenge asks for an approximate answer. The range of flowers a bee visits in a bee lifetime is large (21 000–42 000). 30 000 seems a reasonable estimate. 30 000 x 12 = 360 000 flowers.

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