



A Teachers' Guide to Bees

What is this Guide?

A *Teachers' Guide to Bees* is designed to help teachers establish a clear pathway for incorporating bees into the school curriculum to achieve learning and teaching objectives and outcomes via diverse pedagogical approaches, with bees as the central thematic element.

Australian native
Trichocolletes leucogenys
pollinating a native bush-pea.
(Photo: Kerry Stuart)



Why learn about bees?

In learning about bees, students can experience the joy of scientific discovery and nurture their natural curiosity about the world around them. In doing this, they develop critical and creative thinking skills and challenge themselves to identify questions, apply new knowledge, explain science phenomena and draw evidence-based conclusions using scientific methods. The wider benefits of this 'scientific literacy' are well established, including giving students the capability to investigate the world around them and the way it has changed and continues to change as a result of human activity.

How can my school be involved with bees?

A bee-centric curriculum is as expansive and as in-depth as the imagination! Students can participate in interactive beekeeping experiences via excursions or incursions; growing bee-friendly gardens; creating pollinator havens; constructing insect hotels; undertake citizen-science activities to record and observe insect visitors (bee safari!); and maybe even keep a bee hive.

What do I need to know?

A *Teachers' Guide to Bees* enables teachers to make informed decisions to ensure:

- Children's safety (bees are potentially dangerous to people)
- Bees' health and wellbeing (bees require significant care and management)
- Compliance with school, local council and state legislation requirements.

Bees and the Sustainable Development Goals

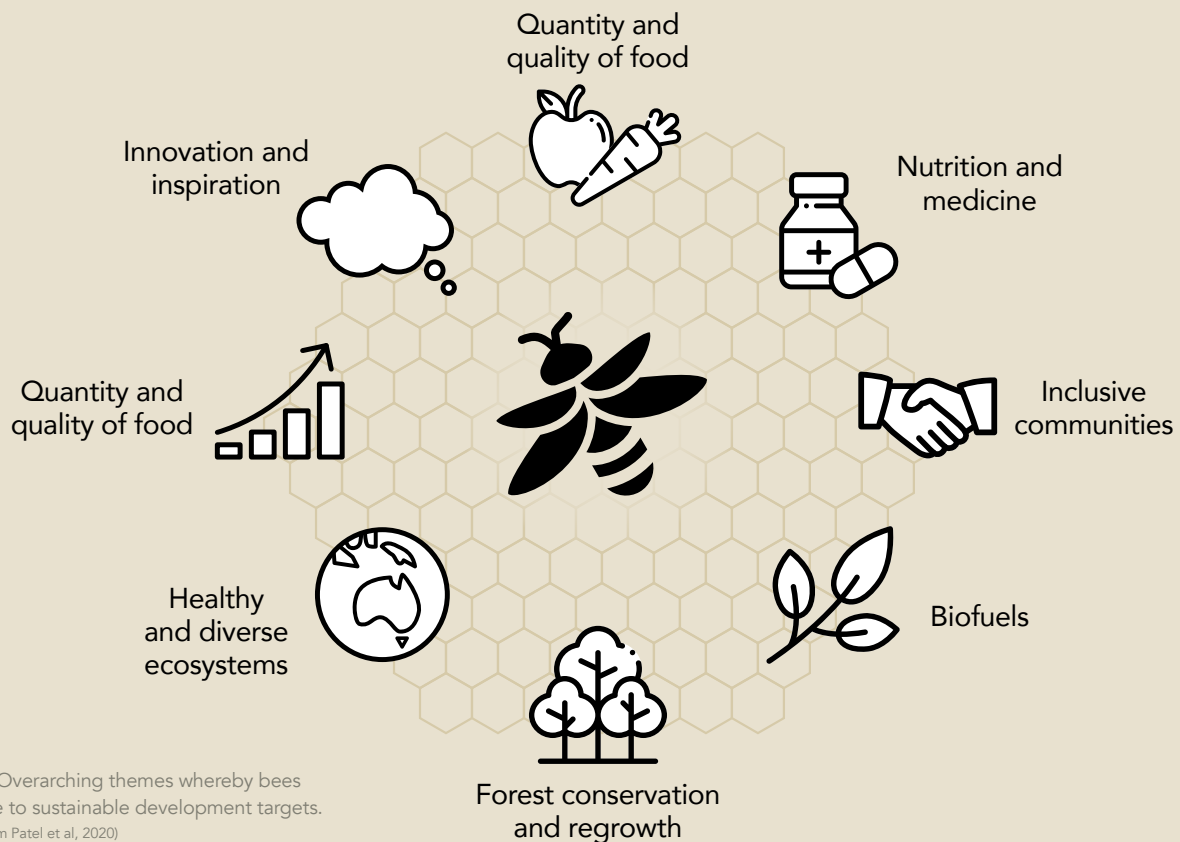


Figure 1. Overarching themes whereby bees contribute to sustainable development targets. (Adapted from Patel et al, 2020)

Bees and the curriculum

Bees are intrinsically linked to sustainability and the sciences.

Bee-centric study units contribute to all 17 of the United Nations Sustainable Development Goals. sdgs.un.org/goals

Study units focusing on bees address the Australian National Curriculum teaching and learning standards for the sciences, incorporating *Science Understanding*; *Science as a Human Endeavour*; and, *Science Enquiry Skills*. Student enquiry into the role of bees in ecosystems and their role as pollinators; understanding of bees, the threats they face and actions to be bee-friendly. Critical and creative thinking, to be equipped to consider the impact of bees based on social, environmental and economic criteria, and encouraged to take action.

References

Patel V et al, 2020, Why bees are critical for achieving sustainable development, Springer Link, <https://link.springer.com/article/10.1007/s13280-020-01333-9>

The When Bee Foundation wants your experience with bees to be positive, informative, safe and educational.

A learning journey with bees

Bees are amazing.

There are over 20,000 species of bees worldwide and Australia has over 2,000 species of native bee. Australia's native bees are highly diverse in colour, shape, morphology, behaviour and size. Australia is home to the smallest bee in the world, the Quasihesma bee (just 1.8mm long) and our largest bee is the Great Carpenter Bee (24mm long).

We can learn a lot from bees.

Honey bees and native stingless bees for example are terrific tools for demonstrating cooperation. When we talk about the 'hive mind' we mean working together for the benefit of the whole community, just like bees because they live together in a colony; rely on each other and work together in highly organised ways; and, divide up essential duties to ensure the colony survives.

Bees are important for food security.

- Bees pollinate one in every three mouthfuls of food we eat.
- Pollinator-dependent food products are important contributors to healthy diets and nutrition.
- The vast majority of pollinator species are wild
- The European honey bee is the most widespread managed pollinator in the world.

Bees are important for biodiversity.

- Bees occupy an important ecological role as pollinators of a range of flowering plants
- Bees are the most dominant taxonomic group amongst pollinators (Patel et al, 2020)
- Australia's native bees have co-evolved with native flora, and many species of native flora rely on native bees for their survival.

Types of bees in Australia.

There are a number of different types of bee in Australia. All play an important role in maintaining food security, biodiversity and ecosystem health.

Native bees — solitary and semi social

Australian native bees can be found across the nation; in cities, suburbs and in rural and remote regions. Most native bee species are solitary and live in hollow stems or in holes in the ground. Schools can best help to support native bees by providing forage and habitat. This can be achieved by planting pollinator friendly gardens and building native bee hotels.

Native bees — stingless

Stingless bees live in colonies just like honey bees. Stingless bees are mainly found in northern and warm-coastal parts of Australia. Stingless bees occur naturally in the wild, but some people (called meliponarists) keep native stingless bees in managed hives. These are an ideal option for schools because they do not sting, but they cannot be kept in cooler climates.



Distribution of native stingless bees in Australia.

European honey bees

Honey bees are managed by beekeepers called apiarists. Honey bees have co-evolved over thousands of years with our food production systems. As well as producing honey, honey bees provide essential crop pollination services in Australia for more than 53 leading food crops, underpinning healthy human diets.

The A, Bee, C decision tree

Thinking about installing a beehive?

Before you obtain a beehive for your school, we recommend you have established:

All year flowering – sufficient food to sustain the bees (honey bees and native bees)




Bee skills and experience

Compliances – school, local government, state biosecurity and animal welfare standards



European honey bee, *Apis mellifera*.

Here is a check list to assist in planning and staging a bee-centric school program.

TYPE OF BEE	Honey bees managed	Stingless bees managed	Wild native bees
TYPE OF HIVE SYSTEM			
ENVIRONMENTAL AUDIT			
Have we assessed the floral resource availability of our school environment?			
• Do we have suitable floral resources to sustain a beehive all year round?			
• Have we provided suitable watering point/s for the bees?			
• Is the site proposed for our beehive safe and suitable?			
• Is the site level and accessible for management?			
• Is the site sheltered from sun, wind and prevailing weather?			
• Is the site removed from lawns than need to be mown or other ground-keeping tasks?			
SCHOOL COMPLIANCE			
Do we have a risk management plan relating to anaphylaxis from bee stings?		N/A	N/A
Have we sought appropriate approvals from school principal and school council?			
Can we commit the time, skills and equipment available to manage bees, particularly in spring to prevent swarming, and over summer and autumn to monitor and manage nectar storage?		N/A	N/A
LOCAL COUNCIL COMPLIANCE			
Have we checked the local council regulations relating to keeping bee hives?		N/A	N/A

STATE LEGISLATION COMPLIANCE			
Have we registered our hive with relevant state authority? beeaware.org.au/code-of-practice/registration		N/A	N/A
Have we paid the relevant hive registration fee?		N/A	N/A
Have we read the Australian Honey Bee Biosecurity Code of Practice? honeybee.org.au/wp-content/uploads/2017/10/Australian-Honey-Bee-Industry-Biosecurity-Code-of-Practice-V1-July-2016.pdf		N/A	N/A
Can we comply with all criteria listed in the Code of Practice? – ie...		N/A	N/A
• Understand we have a legal requirement to register all beehives in our care		N/A	N/A
• Have the skills and knowledge to identify pests and diseases that are notifiable		N/A	N/A
• Understand the requirement to regularly inspect hives for pests and disease		N/A	N/A
• Understand our obligation to control or eradicate pests and disease and manage weak hives		N/A	N/A
• Understand our obligation to maintain records of biosecurity actions and observations		N/A	N/A
• Understand each beehive in our care must be appropriately constructed and branded		N/A	N/A
• Understand we must not allow hives to become exposed or neglected		N/A	N/A
• Understand that we may have our operation assessed by a bee biosecurity officer		N/A	N/A
• Have we the time, skills and equipment resources available to conduct regular inspections of hives through spring and summer to:	a) prevent swarming?	N/A	N/A
	b) harvest honey?	N/A	N/A
AND/OR			
Have we contracted the services of an experienced and qualified Apiary Manager to ensure our bee hive/school apiary is compliant with the Australian Honey Bee Biosecurity Code of Practice? honeybee.org.au/wp-content/uploads/2017/10/Australian-Honey-Bee-Industry-Biosecurity-Code-of-Practice-V1-July-2016.pdf		N/A	N/A
Can the Apiary Manager provide evidence that they can satisfy the following criteria?		N/A	N/A
• Completed the Beekeeper Biosecurity Training and Assessment Program and/or		N/A	N/A
• Completed an approved pest and disease management course		N/A	N/A
• Have a minimum of 3 years' experience with bees			N/A
• Have passed a working with children check			N/A
SAFETY AUDIT & RISK MANAGEMENT			
Have we identified the risks, obligations and responsibilities for public liability and workplace safety?			
• Have we established how many sets of personal protective equipment we require and what sizes?			N/A
• Do we have a weed management strategy that avoids using chemicals near the hive and is safe for operators (e.g., whipper-snipping?)			N/A
• Have we a suitably stocked first aid kit and people trained to administer first aid in the event of anaphylaxis, or allergic reactions?			N/A

* This list is provided as a guide only and may not cover all considerations.

Useful Resources

Australia's Green Carpenter Bee	wheenbeefoundation.org.au/our-work/green-carpenter-bee
Australian Pollinator Week	australianpollinatorweek.org.au
Bee Friendly Farming/Gardening	wheenbeefoundation.org.au/our-work/bee-friendly-farming
Bee Resources for Schools	wheenbeefoundation.org.au/our-work/schools-program
Discovering Australia's Native Bees	wheenbeefoundation.org.au/our-work/discoverbees
Planting Guides for Pollinators	wheenbeefoundation.org.au/our-work/powerful-pollinators
Waggle Dance Activity	wheenbeefoundation.org.au/our-work/waggle-dance
World Bee Day 20th May	worldbeeday.org.au



School bee incursions



BeeActive

Science-based School Incursions

The When Bee Foundation brings the exciting world of bees, and bee-themed activities, to you with a range of school incursion activities and programs, available via on-line delivery or in the classroom.

Bee-centric modules are specifically designed for early primary (P–2), years 3–6, and middle school (years 7–10) curricula standards. Activities and learning experiences are creative, hands-on, engaging, and relevant, and align with relevant curriculum learning areas.



Bee hotel: every bee needs a place to call home. Some bees are solitary, such as many of our native bees, and others live in colonies, such as the honey bee and stingless native bees. The focus of this unit is developed for junior or middle years. Students learn about different bees' needs for a place to nest or raise young, and how people can provide extra places for bees to live by constructing a native bee house. Curriculum areas include mathematical and scientific methods, artistic and creative thinking, as well as kinesthetic learning. (P–10)

Waggle dance: a step to the right, and twirl to the left, and do the bee boogie! Honey bees communicate via dancing, and they have some very specific moves to tell others in the hive where to find pollen, nectar and water. Understand how to decode the 'dance steps' and how to read what the bees are saying. Unleash your creative moves and learn how to do the waggle dance for World Bee Day celebrations. The Waggle Dance unit aligns with science learning areas, as well as performance and expressive arts. (P–6)

Bee-friendly flowers: everyone has a favourite food, and bees are no different to you and me. The food bees seek is pollen and nectar; some plants are highly favoured for quality protein (pollen) and abundant nectar (carbohydrates). This unit is delivered as an age-appropriate session, to introduce students to what bees need to eat to sustain their daily energy requirements, and to provide nourishment for developing larvae and offspring. Group learning is facilitated via co-operative activities to plant and grow bee-friendly flowers. Teaching and learning outcomes relate to biological theory, critical thinking, process and procedure, and observation and measurement (of planted seedlings). (P–10)

Water for bees: it's thirsty work being a bee... did you know that bees and insects need water for their own hydration, and that honey bees need to bring water back to the colony in hot weather to create an evaporative cooling system for the hive? In this interactive experience, suitable for primary-school years, students will learn about what native bees and honey bees need to eat and drink, and regulate the temperature of the hive. A highlight of this session is the opportunity for students to construct their own bee watering stations. Key learning areas include observational techniques, interpretation of fundamental bee biology and its application to practical and hands-on construction and design using found objects. (P–6)

Beeswax wraps: beeswax is a substance produced by honey bees and stingless native bees to make honeycomb, which is the foundation and structure of the hive. Humans have used beeswax for millennia for many things, including eco-friendly beeswax wraps, which can be used instead of single-use plastic film in the home. Learn about waste-reduction, recycling and living sustainably, and making their own beeswax wrap. This unit has a focus on sustainability and reducing waste, reusing, reducing and recycling. Students will learn about properties of beeswax and how bees make it in the hive, and the technical aspects to make a beeswax wrap. (6–10)

Pricing: \$290 +GST /90 min workshop.
Min 2 per day required plus travel for regional areas.

Why When Bee Foundation?

When Bee Foundation are bee specialists in science, education, and bee awareness. Represented nationally by bee ambassadors who are skilled and knowledgeable about honey bees and Australian native bees, When Bee Foundation offers a nationally consistent, quality, science based program, developed by teachers to address core school curriculum areas.

Australian native reed bee,
Exoneura species, on apple
blossom. (Photo: Bees Business)

Front cover: European
honey bees, *Apis mellifera*.
(Photo: Kirrily Hughes)



Contact us or visit the website
for more information on the
BeeActive: Science-based
school incursion program.

Email: info@whenbeefoundation.org.au
WhenBeeFoundation.org.au

