



EDUCATIONAL ACTIVITY KIT

BUSY BEES

Kindergarten to Grade 3
(Preschool to Elementary Cycle 2)



Did you know that the smallest farm animal plays the greatest role in food production? Through play-based or inquiry-based learning, students discover the bee life cycle, how bees turn nectar into honey, and why many plants rely on them to produce fruits and seeds.

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PLAY-BASED LEARNING STATIONS WITH BEES

Before setting up the stations, read a story about honeybees to your class. (Suggestions: *The Honeybee* by Kirsten Hall and Isabelle Arsenault, *Are you a Bee?* by Judy Allen, or *unBEElievables* by Douglas Florian)

After reading the story, go over the stations with the students. Explain how the stations are connected to honeybees.

Mathematics Station

Background

Do you remember what honeybees collect from flowers? Why do they collect pollen and nectar? For food. Honeybees turn nectar into honey. Honey is their winter food. Honeybees mix pollen and nectar together to make bee bread — food for the baby bees, the larva. Can you collect the nectar and the pollen like honeybees? Can you store it in the honeycomb?

Materials

- Yellow (pollen) and pink (nectar) pompoms of different sizes
- Optional: Small, colourful containers to act as flowers to hold the pompoms
- Egg cartons (honeycomb)
- Optional: Plastic tongs

Instructions

1. Place egg cartons, pompoms, and tongs at the centre of a table.
2. Students can sort the pompoms (pollen and nectar) by colour and size in the egg cartons (the honeycomb), or directly on the table. They can make different patterns. They can use their hands or use the tongs.
3. Another option would be to have the pompoms in small containers so kids can take the “nectar and pollen” from the flower container and put it into the “honeycomb” egg cartons.

Questions for further reflection

- Why did you sort the pompoms the way you did?
- Could you have sorted the pompoms differently? How?
- Can you show me the section of the honeycomb with the most pompoms?
- Can you show me the section of the honeycomb with the most nectar (pink pompoms)? And with the most pollen (yellow pompoms)?
- How many patterns have you created?
- How would you describe your patterns?
- Did you choose a specific spot to put the nectar pompoms? The pollen pompoms?
- Do you think the bees choose a specific spot?
- Could I add this nectar pompom to your pattern? Is it still the same pattern?

Water Station

Background

What is nectar and where does it come from? Where do you find it in the flower? How do the bees transport the nectar back to the beehive? Do they use buckets? No, they use their tongue, which is like a straw, to sip the nectar and then they store it in their tummy (honey stomach). *(Use illustrations in the appendix A to show the honey stomach. Students pretend to be honeybees and collect nectar to put in the honeycomb.)*

Materials

- Ice cube trays
- Pipettes
- Water in a container

Instructions

1. Place the container with water, ice cube trays, and pipettes at the centre of the table.
2. Students pretend they are honeybees. They collect the nectar (water) from the flower (container) using the pipette, then fill up the honeycomb (ice cube tray) with water.

Questions for further reflection

- Did you fill all the holes in your honeycomb the same way?
- Which spot has the most nectar? Did you have a reason for that?
- Was it hard to bring nectar to the hive? Or was it really easy?
- Did it take a long time?
- Can you take the nectar from one side of the honeycomb and put it on the other side?
- Does the flower still have nectar?

Play Station

Let the students' imaginations run free.

Pretend play

Students can role play with these different character suggestions: a bee, a beekeeper, a farmer, or a farm animal. They can also pretend to sell honey.

Science Station

Sprouting Echinacea seeds, see page 20 for full explanation.



Art Station

Honeycomb

Materials

- Egg cartons
- Paint and paint brushes

Instructions

1. Place the egg cartons, paint, and paint brushes at the centre of the table.
2. Students paint the egg cartons to act as honeycomb to go in the hive. The students can paint it all one colour, or you can give them a couple of extra colour options to paint in some bees. For the visual learners, print out some pictures in appendix A to show the inside of a hive.
3. Optional: On a wall, outline the shape of the hive so the students can add their honeycomb piece to the hive by taping it to the wall. Or using a big cardboard box with the front cut out to resemble a hive box; the students can stack their honeycomb inside. For a more temporary hive, the students can use blocks (wood, plastic) to make a “hive box” where they can stack their honeycomb. Afterwards, it’s fun to allot time for the students to play bees, adding the nectar and pollen pompoms to the honeycomb.
4. Use various craft materials such as construction paper, tissue paper, and felt sheets to make flowers. The flowers could be displayed in the classroom, creating a meadow for the bees.



See the world through a bee's eyes

Honeybees don't see the world the way we do. Their vision is made up of pixels — many little coloured shapes. Let students create a piece of art the way they think bees would see the world.

Materials

- Pieces of coloured paper
- Scissors
- Glue
- Blank paper or colouring sheets

Instructions

1. Place the coloured paper (either pre-cut paper or add scissors for students to do the cutting), glue, and blank pieces of paper in the centre of the table.
2. Let the students glue on coloured pieces of paper to create a mosaic image. If they wish to have a template, they can glue pieces onto a colouring sheet.



Language Station

Students practise communicating the way bees do: by dance or through scent. If using a storybook, refer back to it and ask students what they have learned from it.

Background

Can we communicate without using words? Yes we can. Some people use sign language. There are many different movements and signs that we make to communicate without words. Can you name a few of them?

Act out the following, and let the students identify the meaning of each movement:

Be silent: index on mouth

It smells bad: pinching nose between fingers

It's hot: fanning face with hand

Stop: palm facing out, arm stretched

Come here: hand or finger gesture

This, that, you, her, etc.: pointing at things or people

What do you they think bees communicate about? Bees have different dances that communicate different things, such as distance, quantity of flowers and/or pollen and nectar, as well as the scent of the field they have found. Honeybees pass information to other bees by dancing.

Option A — Create your own dance 'words'

Teach the students a few dance moves and their associated words. For example, pick a dance move for happy, excited, sad, and angry. The dance moves could be easy arm movements or clapping that could be done while sitting or standing. At circle time, let the students express how they are feeling by dancing/acting out the emotion.

Option B

Have students come up with a dance move to be associated with an object or a station in the class or show a direction. Then have them teach it to the class. The students can practise these new dance moves created by their peers.

Option C

After the students have learned some new dance moves—and their associated meanings—they can play a game similar to broken telephone. Have the students line up, each facing the back of the student next to them. The last student in line taps the person in front of them, on the shoulder, to turn around. Then the last student performs the dance move/hand signal to the student in front of them. Next, the student who just saw the move would turn around and tap the next person on the shoulder to turn around, and show them the dance move. The object of the game is to see how fast they can send a message from one end to the other, and if the right message gets sent along the line. Remind students that they should all stay facing the same direction—unless they get tapped on the shoulder.

Option D

Bees also communicate through scent. You can ask the students if smells (scents or odours) help us discover anything. Some odours mean certain things. Give the students a few examples, then ask them to come up with their own examples.

Examples

Toast burning: time to take the bread out of the toaster or the fire alarm will start.

Smell of food: lunch or supper is almost ready to eat.

Etc...

Bees also pass on messages by producing special scents. Some bee odours mean that there is danger, or that the queen is getting old.

Students can practise their sense of smell by identifying objects according to their scent. Place the objects in socks or other small, breathable bags. Don't forget to tie them off to stop their contents from spilling out.

Ideas for scents

- Tea bags or coffee beans
- Spices such as cloves, cinnamon, cardamom, cumin, fennel, etc.
- A few drops of essential oils or flavour extracts on a cotton ball
- Scented candles
- Food that won't be squished in the sock or bag (apples, whole orange, tomato, etc.)

Questions for further reflection

- How does the scent make you feel?
- What does it remind you of?
- Do you like the smell?
- Can you tell what's in the bag by simply smelling it?



WHO AM I?

(Answers)

Find the names of the three types of bees in a colony.



The queen

I am the mother of the colony.

My abdomen is very long.

I lay more than 1,200 eggs everyday.

The worker

I do all the work in the hive.

I clean, feed, build, fan, guard,
and forage.



The drone

I have extra large eyes and a stout abdomen. I do not have a stinger or pollen baskets and I cannot gather flower nectar using my tongue. I am a male bee.



Name: _____

Date: _____

WHO AM I?

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flower nectar using my tongue. I am
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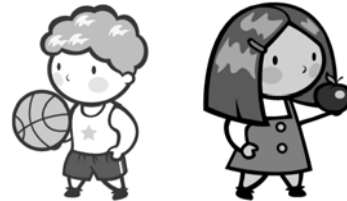


Name: _____

Date: _____

HONEYBEES AND ME

Bees are living creatures, just like you. They need to eat, drink, and breathe to stay healthy. Bees are also very different from humans. Fill in the blanks below to describe how you differ from a bee.



I use my antennae to smell and taste.

I use my _____ to smell and my _____ to taste.

I have five eyes.

I have _____ eyes.

I move around by walking and flying.

I move around by _____
_____.

I have six legs.

I have _____ legs.

I live in a hive.

I live in _____
_____.

I breathe through my skin.

I breathe through my _____
_____.

I hatched from an egg. I was first a larva, then a nymph, before I became a bee.

Before I grew up, I was _____
_____.

Name: _____

Date: _____

THE BEE'S LIFE CYCLE

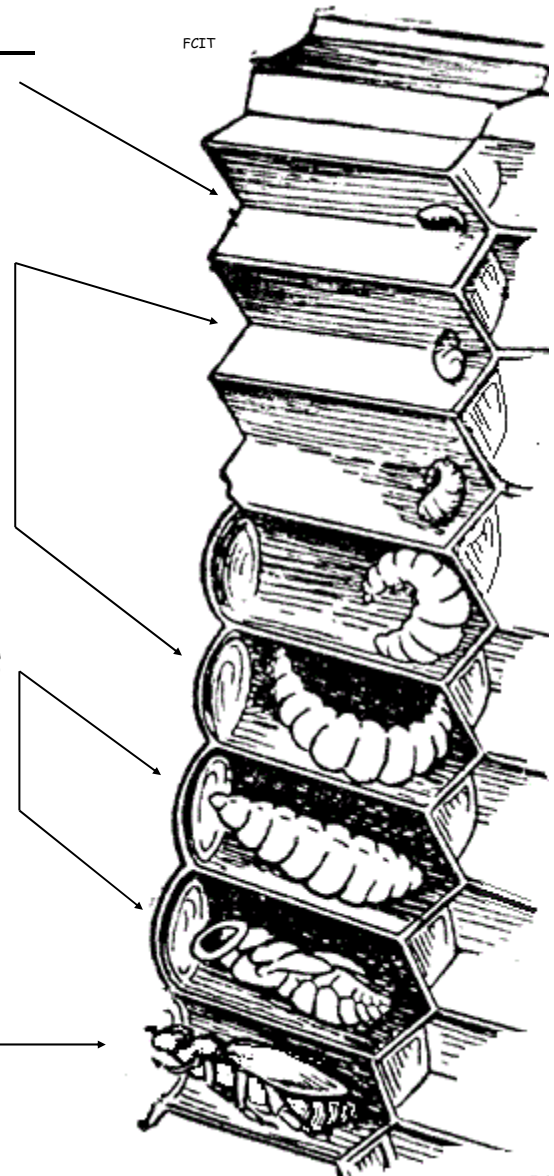
These are the stages in the metamorphosis of a worker bee. Use the words at the bottom of the page to fill in the blanks.

The queen lays an _____
on the bottom of a cell.

The egg hatches. The worker bees
feed the _____.
The larva grows and the worker bees
close the cell with beeswax.

The larva spins a cocoon and transforms
into a _____.

The metamorphosis is complete.
The _____
chews on the wax and leaves its cell.



egg

bee

pupa

larva

FROM NECTAR TO HONEY

How do bees turn nectar into honey? Using their imaginations, students try to describe the process, correcting their stories using knowledge gained either at the museum or through the Educational Activity Kit.

Materials

- Large sheets of paper
- Illustrations on how bees produce honey (attached)
- Markers

Instructions

Part 1: Honey as imagined by students

1. Divide the class into groups of three or four, and give each group a large sheet of paper and several markers.
2. Using drawings and/or text, students explain how they think bees make honey. What do the bees use as raw materials? How do the bees transform these substances into honey?
3. Invite each group to share its drawings and/or text with the class.

Part 2: The actual production of honey (if your class does not take part in the “Busy Bees” program)

1. If possible, make colour copies of the illustrations describing the production of honey (Appendices A-1 to A-6).
2. As a class, read the texts describing the illustrations. Mix up the illustrations, and ask students to put them back in the correct order.

Part 3: From nectar to honey

1. Using the same groups, give each group a large sheet of paper and several markers.
2. Using drawings and/or text, students must explain again how bees make honey, based on what they've learned.
3. Give each group the answer sheet they created during the first part of this activity. Compare these sheets with their new drawings and texts. Identify the elements that have changed, as well as those that have remained the same. Ask students what they have learned.

BUG FARMING

Domesticated bees are not the only insects people raise. The goal of this activity is to help students discover the many different types of insect-rearing activities around the world, as well as their products and by-products.



Materials

- Photographs of insect-rearing activities and/or photographs of the insects themselves (Appendices B-1 to B-9)

Instructions

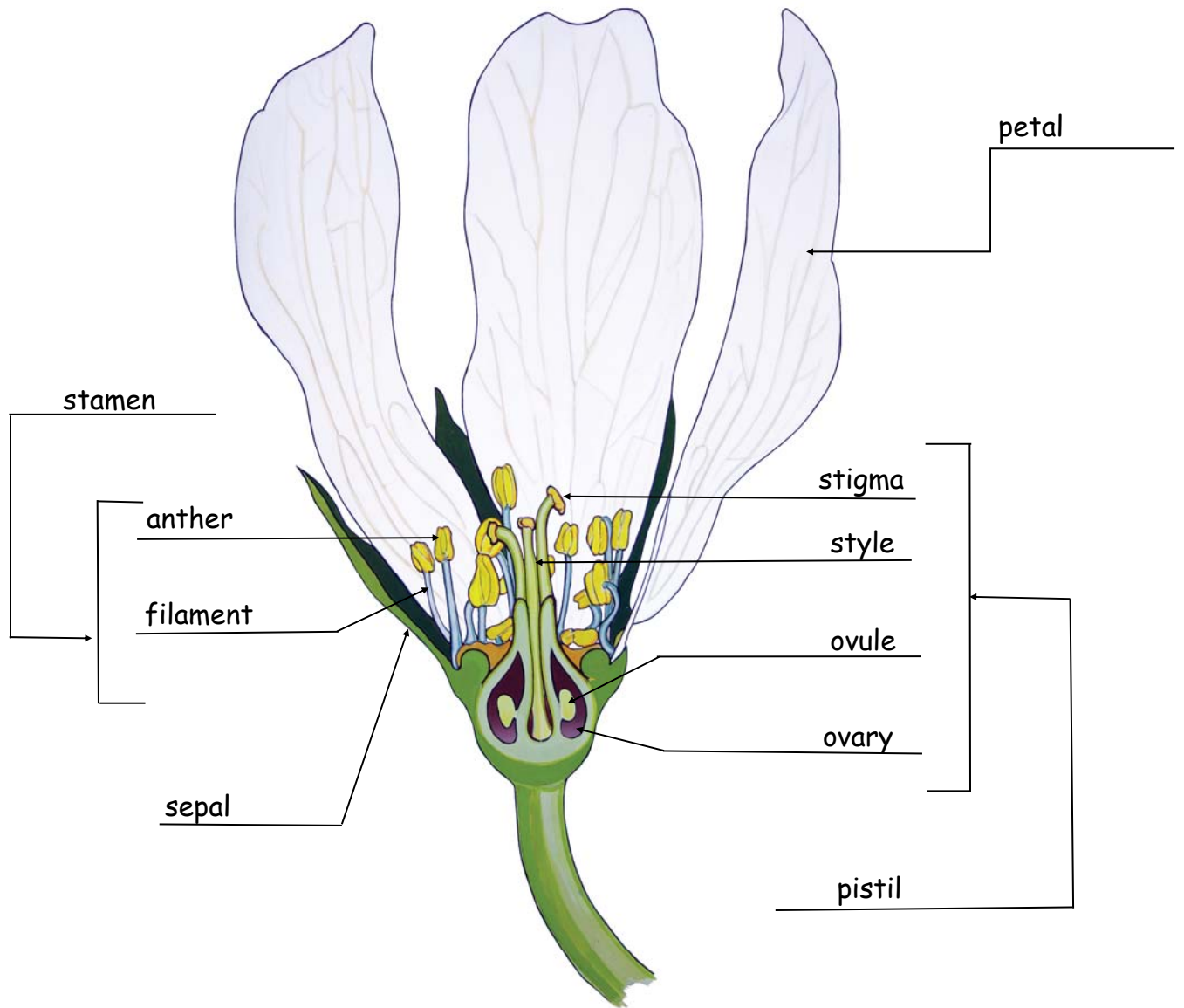
1. Explain to students that domesticated bees are not the only insects raised on farms. There are many others. Show students photographs of insect-rearing activities and/or the insects that are raised. Ask them if they know of these insects, and why they are raised. Explain that certain insects, such as silkworms and bees, are raised to make products or foods used by people. Others are raised because they eat insects that harm crops—sometimes even replacing synthetic insecticides in the fight against crop-destroying pests.
2. **Option 1:** Divide the class into smaller groups. Assign each group one insect from the list in appendix B. Have the students research why people raise these insects, and how they are used. Groups can prepare a PowerPoint presentation, poster, video, or other media to share their findings with the class.
Option 2: Write the names of the insects on the chalkboard and, for each, identify one or more products that come from raising them. If necessary, refer to the attached table listing the various insects people raise, along with their uses.
3. Discuss the importance of these insects to humans.

PARTS OF A FLOWER

(Answers)

Use the words at the bottom of the page to name the different parts of a flower, then answer the questions on flowers and pollination.

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pistil

anther

petal

stamen

style

ovary

stigma

sepal

filament

ovule

PARTS OF A FLOWER

(Answers)



The pollen seed and the flower are compatible.

The pollen sprouts.

The pollen tube grows down the style to ovary and releases the male seeds.

The ovule is fertilized.

It turns into a seed.

1. What is the name of the flower's male organ? It includes the anther and the filament.

Stamen

2. What is the name of the flower's female organ? It includes the stigma, the style, the ovary, and the ovule.

Pistil

3. Where in the flower are grains of pollen formed?

Anthers

4. What is pollination?

Transfer of pollen from the stamen to the pistil

5. What happens to the ovule after it is fertilized?

It turns into a seed

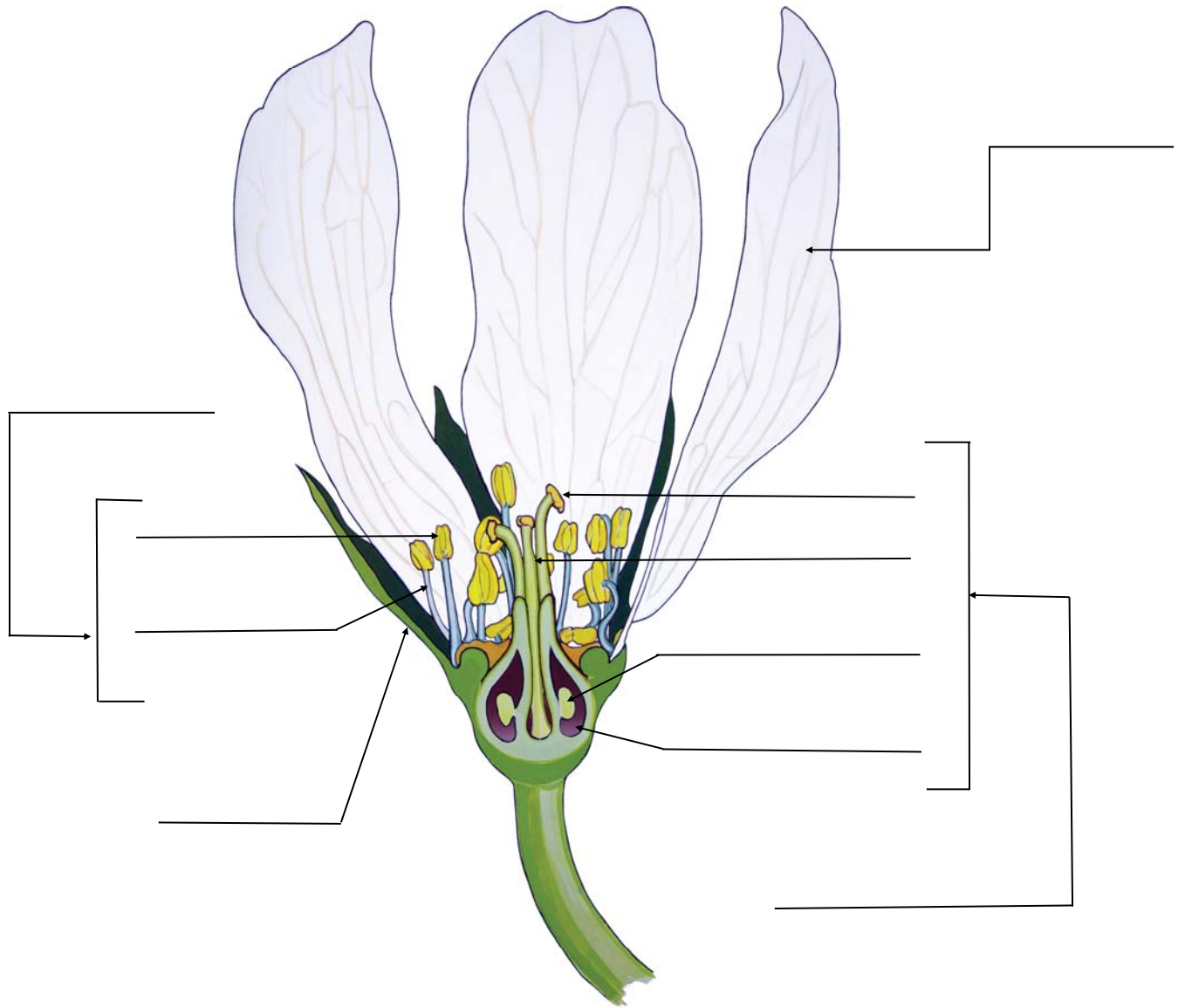
Name: _____

Date: _____

PARTS OF A FLOWER

Use the words at the bottom of the page to name the different parts of a flower, then answer the questions on flowers and pollination.

© Peter Buwalda



pistil

anther

petal

stamen

style

ovary

stigma

sepal

filament

ovule

Name: _____

Date: _____



PARTS OF A FLOWER

The pollen seed and the flower are compatible.

The pollen sprouts.

The pollen tube grows down the style to ovary and releases the male seeds.

The ovule is fertilized.

It turns into a seed.

1. What is the name of the flower's male organ? It includes the anther and the filament.

2. What is the name of the flower's female organ? It includes the stigma, the style, the ovary, and the ovule.

3. Where in the flower are grains of pollen formed?

4. What is pollination?

5. What happens to the ovule after it is fertilized?

KIDS TO THE RESCUE!

For several years, populations of pollinating insects have been declining. The destruction of their habitat and the disappearance of their food sources are among the principal causes of this decline. Luckily, your students can come to the insects' rescue by planting flowers rich in nectar and pollen in your community.

This activity takes place over a period of several months. By cultivating melliferous plants (plants rich in nectar) native to North America in the classroom, students learn how to grow and care for a plant that they can transplant outside in the spring. These plants will provide pollinating insects—such as bees, butterflies, flies, and thousands of others—with food in your community.

Materials

- Echinacea seeds
- Pots (recycled yogurt cup or other similar objects from students' lunch boxes)
- Soil (type not important)
- Trays
- Small watering can
- Plastic wrap

Before the activity

If your class participates in the Busy Bees school program at the Canada Agriculture and Food Museum, museum staff will give you a free bag of echinacea seeds. If you do not take part in the program, echinacea seeds can be found at most nurseries and garden supply centres.

Instructions

1. Introduce the term **pollinating insect**. Explain they carry pollen from one flower to another. To produce seeds and fruit (babies), the flowers must first be fertilized: the pollen (the male part) must land on a style (the female part). Pollinating insects feed on nectar and/or pollen produced by flowers. As they forage for food, the insects accidentally transport pollen from flower to flower. Pollinating insects are thus very important. Without them, many flowers would not produce fruit and seeds at all.
2. Ask students to name some pollinating insects, and write the names of these insects on the chalkboard. These are the insects that we often see on flowers. The ones covered in fine hairs are the best at carrying pollen. The pollen sticks to their hairs as if they were made of Velcro.

3. Identify the *needs* of pollinating insects. Write them on the chalkboard.
4. Tell students that there are fewer and fewer pollinating insects in the world every day. Why? There are many reasons, including the *destruction* of their habitat, which means less food and nesting sites for pollinating insects.
5. How can we help pollinating insects? The goal of this activity is to grow a plant—*echinacea*—that produces a lot of nectar and pollen, the food eaten by pollinating insects. Echinacea is native to North America. It is a perennial plant, which means that it lives for many years. The stem and leaves die in the autumn, but the roots survive throughout the winter, allowing the plant to grow back in the spring. Echinacea is hardy and easy to cultivate: it tolerates cold, drought, and other difficult conditions. Once established, it spreads in the garden by *seeding* itself. If it is planted indoors early, during the winter, it produces beautiful flowers with purple (rose-mauve) petals the following summer.
6. Give each student a flowerpot (clean yogurt, pudding, or other container, pierced with several holes in the bottom).
7. Fill the pots with soil and press it down firmly. Leave the top 2 cm of the pot clear of soil, to make it easier to sow and water the seeds.
8. Give each student three or four echinacea seeds. Have them place the seeds in the centre of the pot and cover them very lightly with soil (1 to 2 mm only).
9. To avoid spills, place the pots on trays. Pour water onto the trays, rather than directly into the pots. The soil will absorb water from the tray through the holes pierced in the bottoms of the containers.
10. Keep the containers in a warm, shaded location until the seeds germinate. To keep the soil moist, cover the pots with plastic wrap. The seeds may take several weeks to sprout. Remove the plastic wrap when the sprouts reach it.
11. Keep the plantlets in the sun. Echinacea needs lots of light to grow. Keep the soil barely moist. Echinacea doesn't like waterlogged soil.
12. In the spring, transplant the plants outside in the school garden, or give the plants to the students. Echinacea plants make lovely gifts!

Suggestions

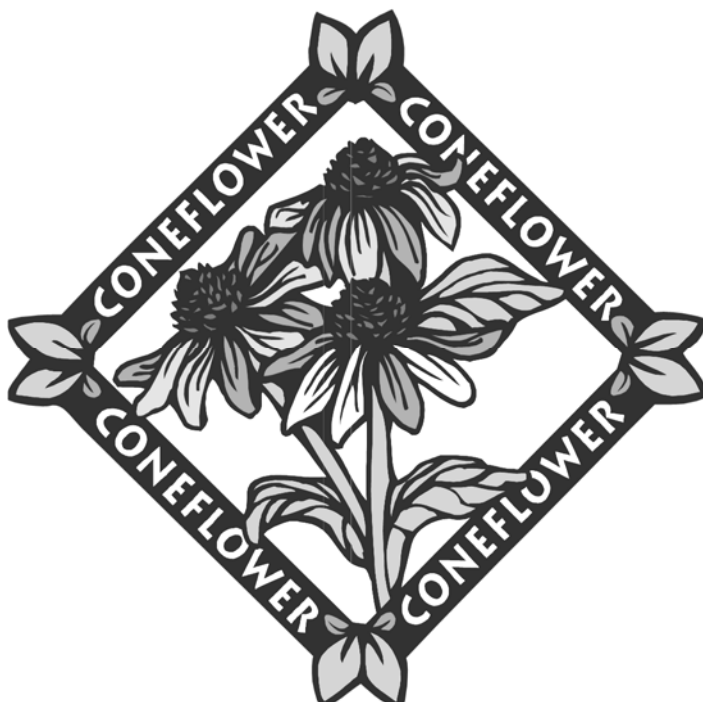
Observation journal

Students can create individual journals, or the class as a whole could create a journal to track the progress of the plants. Here is a list of suggested elements that students could observe and note in their journals:

- sowing date
- germination date
- watering (date and quantity)
- growth of plants (measure growth at regular intervals using a ruler or other measuring tool)
- illustrate growth with drawings (germination, first pair of leaves, second pairs of leaves, etc.)
- plant's appearance (healthy, withering, yellowing, etc.)

Reading and comprehension activity on the Purple Coneflower (Echinacea)

Students can read the text on purple coneflowers in the Language section and answer the questions.



TELL ME A STORY

Since a picture is worth a thousand words, this activity is designed to encourage students to write a short story, using a humorous illustration as their starting point.

Materials

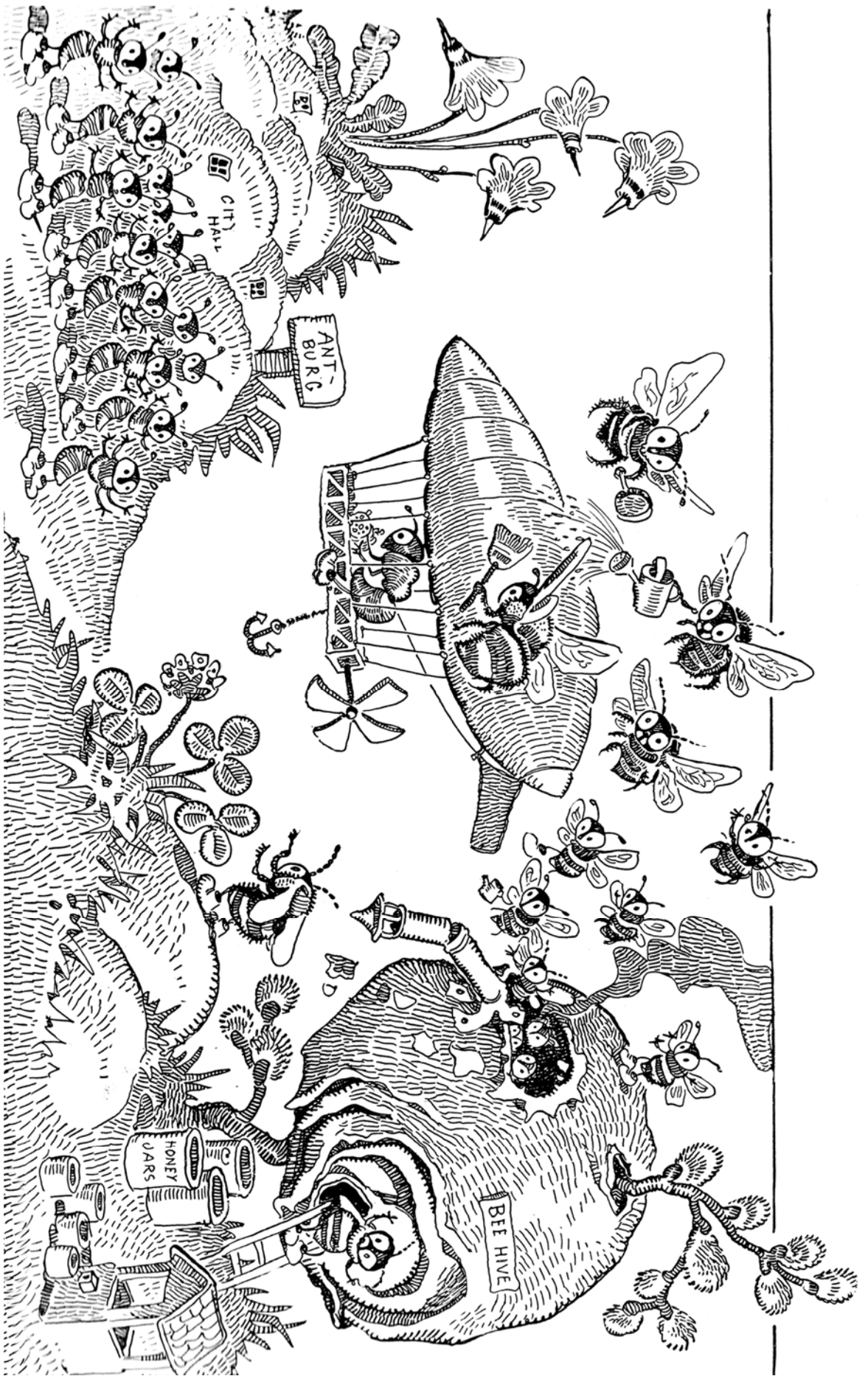
- Tell Me a Story activity sheet
- Crayons (optional)
- Humorous Illustration
- Stapler (optional)

Instructions

1. Give all students a copy of the “Tell Me a Story” activity sheet, as well as a copy of the humorous illustration.
2. Using the elements in the illustration as a starting point, ask students to think up and write a short story on the activity sheet. Remind them to write the title of their story at the top of the page.
3. Students can also colour the illustration and staple it to their story.
4. Ask students to read their stories to the class, or to a smaller group of students. Discuss the similarities and differences between their stories. Although all of the stories used the same illustration as a starting point, none of the stories are identical. Why is it so?

Suggestions

1. **Preschool and Kindergarten students**
Use the humorous illustration as a colouring page. Ask students to describe what they see. What are the ants and bees doing? More advanced students could write a title at the top of the page, describing the illustration.
2. **All levels**
In books and films, animals often have human or stereotypical characteristics. Hand out copies of the illustration and ask students to identify the human characteristics that have been given to the insects. Ask students if they have seen films or cartoons featuring insects. Discuss realistic and unrealistic ways of describing insects.



WORD SEARCH

(Answers)

W	C	O	L	O	N	Y	H	I	V	E
A	B	D	A	N	C	E	E	E	G	S
T	F	L	Y	I	N	G	R	N	Q	M
E	H	O	N	E	Y	E	I	D	U	O
R	B	E	A	R	K	P	N	R	E	K
L	S	U	N	R	E	E	N	O	E	E
A	W	K	O	E	L	B	E	N	N	J
R	A	W	K	L	M	E	C	E	P	A
V	X	E	O	O	E	G	T	F	U	R
A	E	P	C	E	P	G	A	A	P	E
B	F	L	O	W	E	R	R	N	A	R

Words to find:

bear	egg	jar	smoke
beekeeping	fan	larva	sun
comb	flying	nectar	water
colony	flower	pollen	wax
dance	hive	pupa	worker
drone	honey	queen	

Use the leftover letters to complete the following sentence:

A person raising and caring for honeybees is called a B E E K E E P E R

Name: _____

Date: _____

WORD SEARCH

W	C	O	L	O	N	Y	H	I	V	E
A	B	D	A	N	C	E	E	E	G	S
T	F	L	Y	I	N	G	R	N	Q	M
E	H	O	N	E	Y	E	I	D	U	O
R	B	E	A	R	K	P	N	R	E	K
L	S	U	N	R	E	E	N	O	E	E
A	W	K	O	E	L	B	E	N	N	J
R	A	W	K	L	M	E	C	E	P	A
V	X	E	O	O	E	G	T	F	U	R
A	E	P	C	E	P	G	A	A	P	E
B	F	L	O	W	E	R	R	N	A	R

Words to find:

bear	egg	jar	smoke
beekeeping	fan	larva	sun
comb	flying	nectar	water
colony	flower	pollen	wax
dance	hive	pupa	worker
drone	honey	queen	

Use the leftover letters to complete the sentence:

The person that raises and cares for honeybees is called a

_____.

THE PURPLE CONEFLOWER



Do you know what the purple coneflower is? It is a plant that produces pretty purple flowers. Its centre looks like a porcupine. That's where the flower secretes a sweet liquid called nectar. Some insects, including bees and monarch butterflies, feed on coneflower nectar. So do hummingbirds!

The purple coneflower loves dry, sunny gardens. It doesn't need much attention, and spreads through its seeds. Coneflower seeds can only germinate in the spring, because they need the cold days of winter to break their dormancy. It is as though the cold wakes them up.

The purple coneflower is a perennial. This means that it lives for several years, and doesn't die in the winter. In the fall, the leaves and stem dry out, but deep in the earth, the roots are still alive. In the spring, new stems grow and the plant comes back to life.

The purple cone flower, also known as *Echinacea purpurea*, is a medicinal plant, which means that it is often grown to make medicines. It can help fight a cold.

THE PURPLE CONEFLOWER

(Answers)



1. What does the centre of the purple coneflower look like?

a porcupine

2. Name three creatures from the animal kingdom that feed on purple coneflower nectar.

bee, monarch butterfly, hummingbird

3. Why do purple coneflower seeds only germinate in the spring?

the cold of winter breaks their dormancy

4. What part of the purple coneflower doesn't die in the winter?

the roots

5. Why is the purple coneflower grown?

to make medicines



Name: _____

Date: _____

THE PURPLE CONEFLOWER



1. What does the centre of the purple coneflower look like?

2. Name three creatures from the animal kingdom that feed on purple coneflower nectar.

3. Why do purple coneflower seeds only germinate in the spring?

4. What part of the purple coneflower doesn't die in the winter?

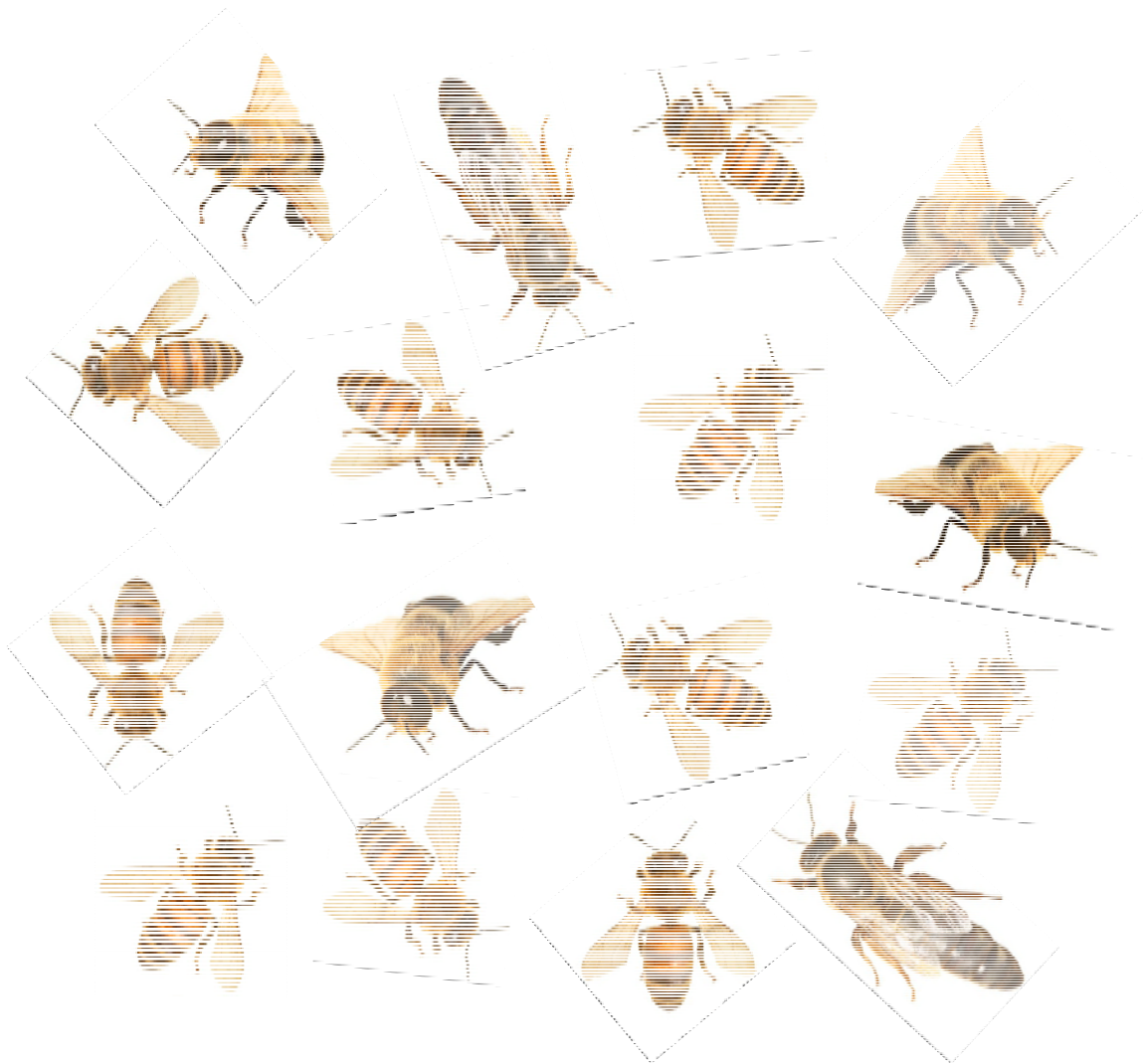
5. Why is the purple coneflower grown?



Name: _____

Date: _____

COUNT THE BEES



How many queens are there? _____



How many drones are there? _____



How many workers are there? _____



Name: _____

Date: _____

A GOLDEN HARVEST

A beekeeper has harvested six honey supers (boxes). Inside each honey super, there are 10 frames of honeycomb.

How many frames are there all together? Show your work.

Seven frames are empty. The bees haven't stored any honey in these frames. How many frames are filled with honey? Show your work.

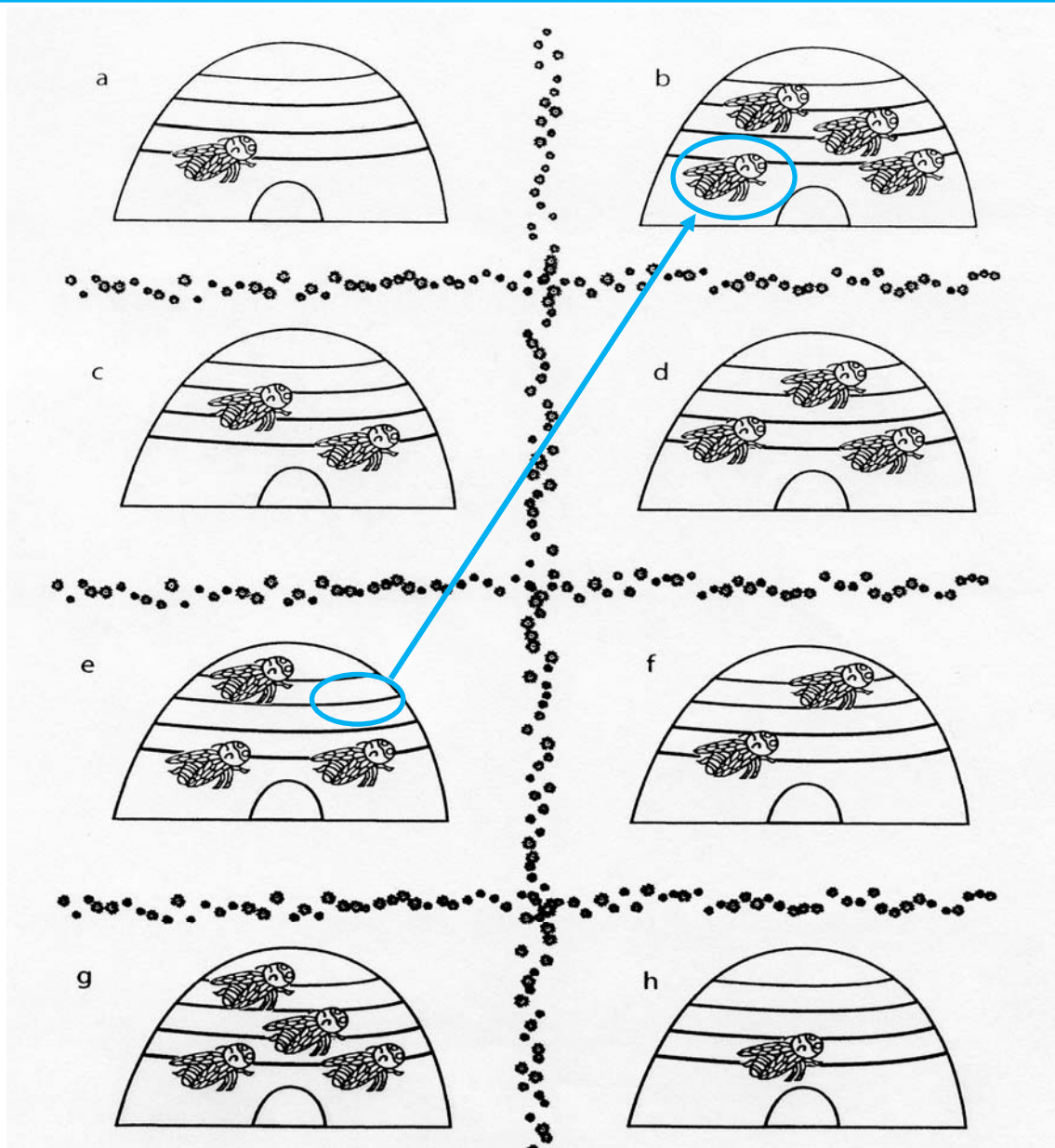
BEES ON THE MOVE

(Answers)

Move one bee from one hive to another so that all rows and columns have the same amount of bees in them.

Hint: Each row should have five bees and each column should have 10.

Answer: Move one bee from hive (e) to hive (b).

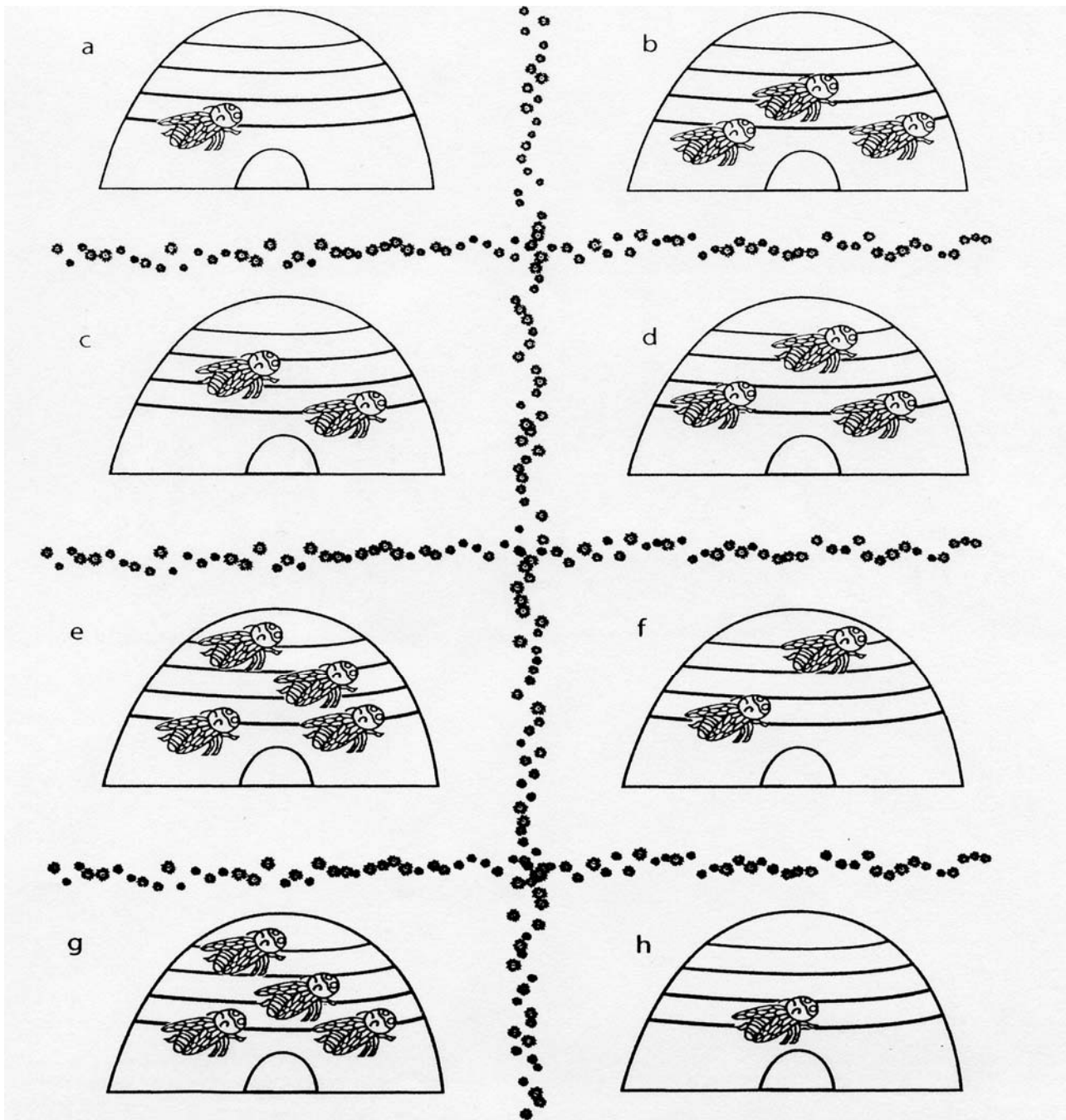


Name: _____

Date: _____

BEES ON THE MOVE

Move one bee from one hive to another so that all rows and columns have the same amount of bees in them.



BRAN HONEY MUFFINS



250 ml	boiling water	(1 cup)
250 ml	bran	(1 cup)
50 ml	honey	(¼ cup)
50 ml	canola oil	(¼ cup)
250 ml	raisins	(1 cup)
375 ml	whole wheat flour	(1 ½ cups)
8 ml	baking soda	(1 ½ tsp)
3 ml	salt	(½ tsp)
125 ml	wheat germ	(½ cup)
2	beaten eggs	2
250 ml	buttermilk	(1 cup)



Allergy Warning!

Contains wheat, eggs, and milk.

In a bowl, mix boiling water, bran, honey, oil, and raisins, and set aside for five minutes. In another bowl, mix flour, baking soda, salt, and wheat germ. In a third bowl, mix eggs and buttermilk. Add the flour mixture to the water mixture and then add egg and buttermilk mixture. Fill greased muffin tins 2/3 full. Don't taste the batter. Uncooked flour and eggs may contain bacteria that could make you sick.

Bake at 175°C (350°F) for 25 minutes.

Makes 12 muffins

HONEY LIP BALM

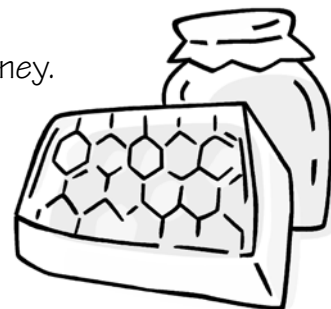
Discuss beehive products and by-products with your students. Explain that honey contains antibiotic elements that inhibit the growth of bacteria. Throughout history, honey has been used to help heal throat infections and colds. Beeswax is secreted by the wax glands of honeybees and used to build combs. When combs are damaged or too old, beekeepers melt them. They sell the wax or build new foundations. Beeswax can be found in beauty products of all kinds. Honey and beeswax are excellent at helping to heal dry winter lips. Make this lip balm recipe with your students in class.

15 ml	grated beeswax	1 tbs
10 ml	almond oil	2 tsp
5 ml	honey	1 tsp
12 drops	essential oil (orange, mint, lavender, etc.)	12 drops

Ask students to bring in little containers with lids. You can also use empty mint tins or make-up containers.

Preparation

1. In a double boiler, melt the beeswax, almond oil, and honey.
2. Remove from heat and add essential oil.
3. Pour liquid into small containers and let cool.



To make more lip balm, double or triple the recipe.



© Peter Buwalda

The foraging bee sees ultraviolet light reflected on the petals of a flower. It tells her where the nectar is.



© Peter Buwalda

The bee lands on the flower. She sucks the nectar droplets and stores them in her honey sac.



© Peter Buwalda

When she is full, the foraging bee flies back to the hive. Inside her honey sac, the nectar begins to turn into honey.



© Peter Buwalda

Inside the hive, the foraging bee regurgitates the nectar and passes it to a hive bee.



The hive bees deposit small droplets of nectar on the honeycomb walls.

Hive bees fan their wings over the honeycomb. Water evaporates out of the nectar.

© Peter Buwalda



© Peter Buwalda

When the cell is full and the honey is ripe, hive bees seal the cell with a thin layer of wax. The wax prevents the honey from absorbing water from the surrounding air and spoiling.

Bug Farming

Silkworm Moth (This form of insect-rearing does not exist in Canada—it occurs primarily in China, Japan, and France)

The silkworm moth (*Bombyx mori*) is a domesticated moth raised to produce silk. Its caterpillar, the silkworm, produces a large amount of syrupy fluid that, when it hardens, transforms into a silk filament. The caterpillar uses this thread to weave a cocoon. The raising of caterpillars for the production of silk fibre is called sericulture.

To get the silk, you must first kill the caterpillars (chrysalids) without damaging the cocoons. The cocoons are suffocated, then soaked in boiling water to soften them. Each cocoon produces a thread called a bave. The ends of several baves are joined together to form a thread. This is how the cocoons are unwound.

Silk is extremely soft to the touch, light, supple, lustrous, and absorbent. It protects against cold and heat, is elastic, and keeps its shape well.

Bumblebee

Bumblebees are excellent pollinators. They like to forage near their nests, they work quickly, and are not afraid to forage in confined spaces. This is why they are useful in greenhouses. Their large bodies allow them to harvest a great deal of pollen.

Bumblebees are raised for the pollination of crops in greenhouses and fields. Their hives have four sections, each containing a small colony of bumblebees.

Alfalfa Leafcutter Bee

This solitary bee is raised for the pollination of alfalfa and the resulting production of seeds. Dairy cattle that feed on alfalfa produce more milk than with any other forage crop. To cultivate alfalfa, dairy farmers must first buy seeds.

The cocoons or pupae (intermediate stage between the larva and adult) of the bee are placed in alfalfa fields. The bees that emerge begin immediately to pollinate the alfalfa that surrounds them.

Ladybug

Used by gardeners as a form of biological warfare against plant pests such as aphids and cochineals, ladybugs can effectively replace certain pesticides.

Ladybugs are sold in specialty garden stores, or by mail. Ladybugs are generally sent through the post in their larval stage.

Trichogramma

This tiny (0.5mm) stingless wasp is used to fight certain species of moth pests such as the corn borer moth, which in its caterpillar stage destroys corn stalks. Trichogrammas are also used to fight against the cabbage white moth (a small white moth with black spots on its wings).

The female trichogramma lays its eggs on the eggs of the pest moths. The larvae of the trichogramma then feed on the contents of the pest's eggs.

Trichogrammas are raised industrially in biofactories and placed in cold rooms for several months. They are sold and released as soon as moth pests begin appearing among crops.

Cricket

Crickets are raised to feed insectivorous animals, such as reptiles, trapdoor spiders, and scorpions. They are raised in tubs and are sold in pet shops or by mail. They are also used as fishing lures.

Crickets are also raised for human consumption, even in Canada (the Insectarium in Montreal offers tastings). Crickets are rich in protein and taste like hazelnuts.

The Grasshopper and the Locust

Like crickets, these insects are raised to feed pets (reptiles, scorpions, tarantulas, and praying mantises), but also serve as food for millions of human beings. Grasshoppers and locusts are the most highly-consumed insects in the world. They are collected primarily in the wild, but they are also raised on a semi-industrial basis. In Africa and the Middle East, the dry season frequently brings invasions of migrating locusts, which ravage cereal crops. These insects are an abundant food resource, often helping populations in these regions to survive famine. Grasshoppers and locusts are also considered delicacies in several parts of the world, including Canada.

Some other insects raised by people:

- praying mantis (pet)
- cockroach (pet food, human consumption, and laboratory research for the development of insecticides)
- mealworm (pet food, composting, and human consumption)
- fly (pet food)
- stick insect (pet)
- Mediterranean fruit fly (raised by the millions, the flies are sterilized then released into nature, where they mate with wild flies, thus preventing them from reproducing)
- *Hymenoptera Spalangia* and *Hymenoptera Muscidifurax* (small wasps that lay their eggs on the pupae of houseflies, helping to control the numbers of flies in barns).

Silkworm Moth (*Bombix mori*)



These silkworm caterpillars are spinning their cocoons.



Silkworm moth, cocoon, and caterpillar

Bumblebee



This bumblebee hive has four sections. Each one contains a small colony of bees.



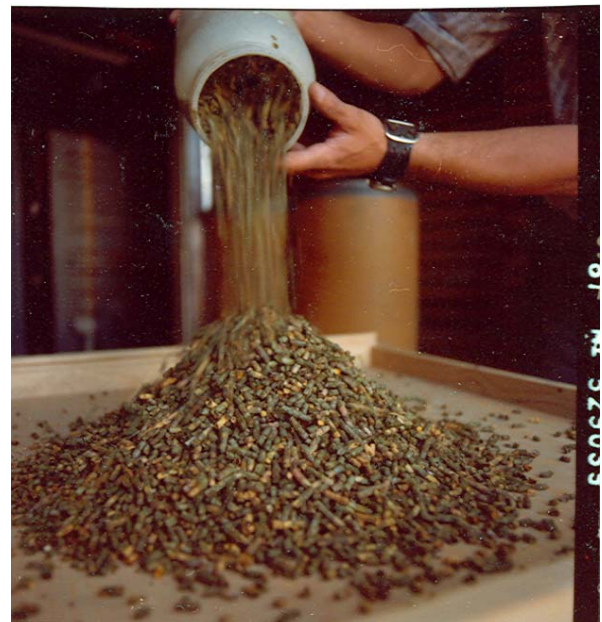


Alfalfa Leafcutter Bee



Saskatchewan Archives Board

Thousands of alfalfa leafcutter bee pupae have been put in this shed.



Saskatchewan Archives Board

Each cocoon contains an alfalfa leafcutter bee pupa, the stage between larva and adult bee.

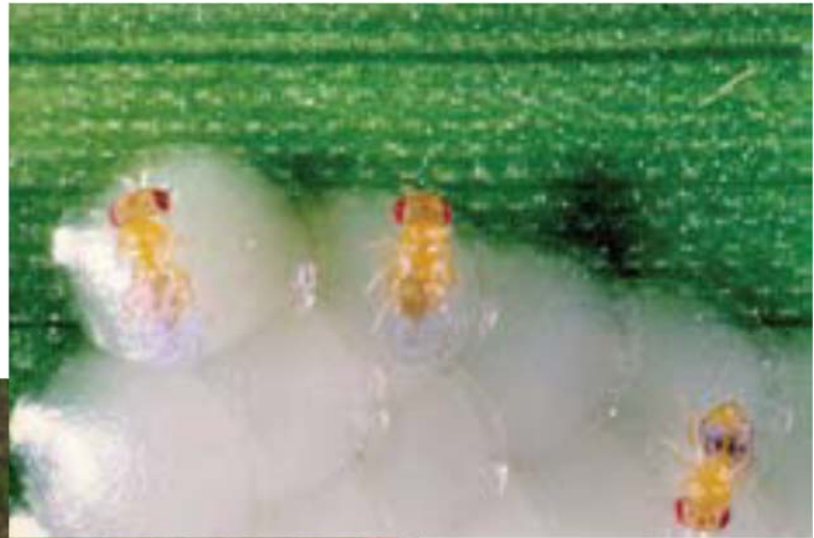
Ladybug



The ladybug is an insectivore, which means that it feeds on insects. It is particularly fond of aphids and can eat as many as 100 in a single day. Aphids are small pest insects that feed on plant sap.

Trichogramma Wasps

The female wasps lay their eggs inside the corn borer's eggs.



S. Dupuis, Para-Bio



A. Pelletier, Maelström créatif

Trichogramma wasps are distributed to farmers as eggs. Each card has more than 8,000 eggs on it.



S. Dupuis, Para-Bio

<http://www.parabio.ca/brochure.pdf>

Set directly on the corn plants, the cards are distributed evenly across the corn field.

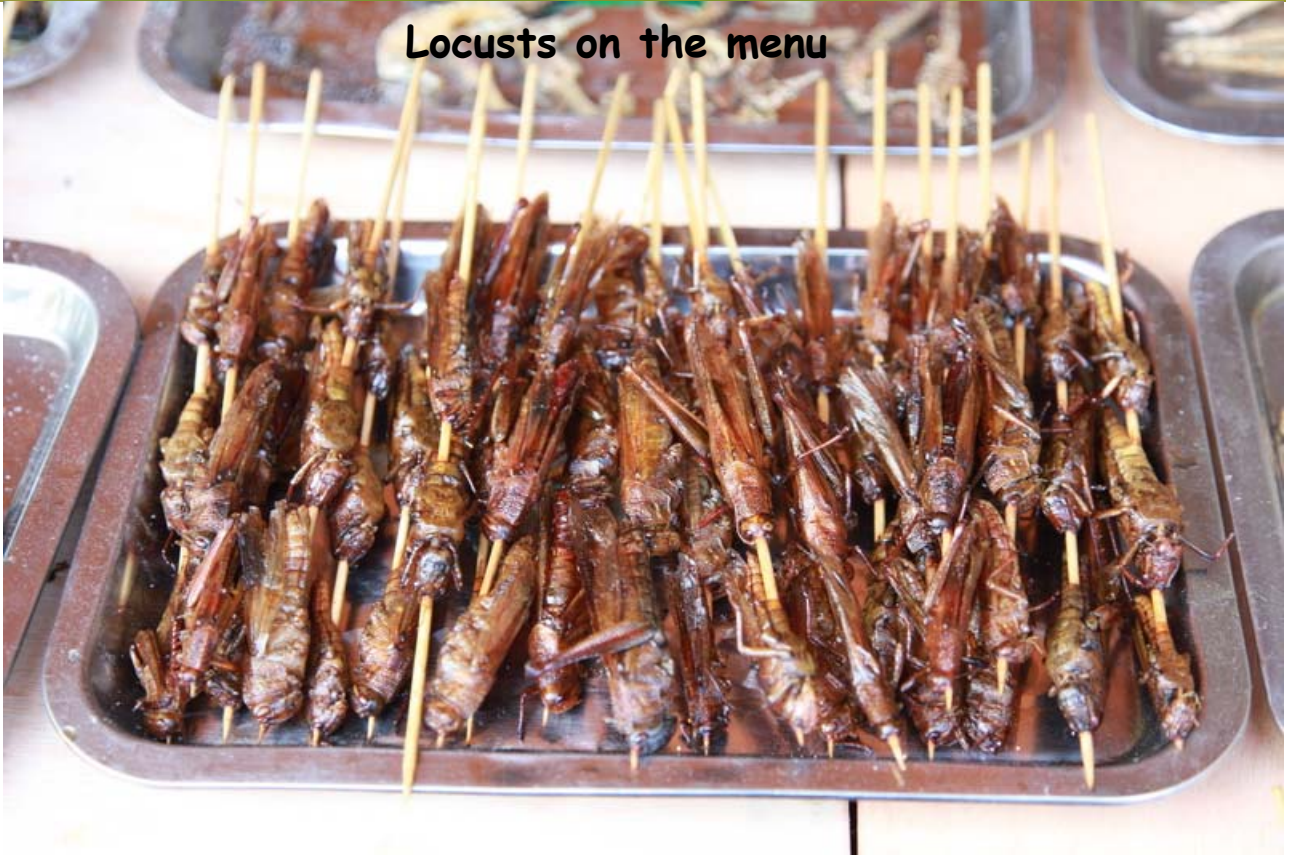
Cricket



Grasshopper



Locusts on the menu



VOCABULARY LIST

bee dance	egg	nectar
beekeeper	extractor	pollination
beekeeping	fanning	pollen
beeswax	filter	pupa
bee yard	foundation	queen
brood	foraging	reproduction
cell	frame	smoker
centrifugal force	guard bee	super
colony	hive	uncapping knife
cooperation	honeycomb	worker bee
drone	larva	

ADDITIONAL RESOURCES

For additional activities on farm animals, agricultural plants and nutrition, please visit the museum's website, at <https://ingeniumcanada.org/cafm>. The Educational Activity Kits can be found in the Educational Programs section. They are free and available in both official languages.

Bees: A Honey of an Idea is an online exhibition exploring the essential role bees play in the pollination of many Canadian food crops.

Visit <https://ingeniumcanada.org/exhibitions/bees-a-honey-of-an-idea>.

Bee Odyssey is an engaging and beautiful adventure game that allows players to try flying and surviving from the micro-perspective of a honeybee.

Take on the role of a lost bee as she tries to find her missing hive. Pollinate flowers, navigate obstacle-filled paths, and evade predators and pesticides.

Download a free version of *Bee Odyssey* now on iTunes or Google Play.



FCIT Clipart is a courtesy of Florida Center for Instructional Technology at <http://etc.usf.edu/clipart>

FUN FACTS

- A single honeybee makes 0.8 g (1/10 tsp) of honey in its lifetime.
- Bees contribute not only to the increased production of fruits and vegetables (crop pollination), but also to their size.
- A honeybee flies at a maximum speed of 24 km/h and its wings beat 200 times per second, or 12,000 times per minute.
- The colour and taste of honey varies, depending on the flowers (the source of nectar) visited by the bees.
- The average lifespan of a honeybee during the working season is about six weeks.
- In the summer, a colony of honeybees contains 50,000 to 80,000 bees.
- The average Canadian consumes one kg of honey a year.
- Bees have four wings.
- As native pollinators continue to disappear, the production of many everyday foods depends more and more on honeybees.
- Honeybees must visit about four million flowers to produce one kg of honey.
- The individual cells of a honeycomb have six sides.
- Bees have been producing honey from flowers for about 10 to 20 million years.
- The bulging eyes of the drones help them to spot the queen.
- In Canada, the value of fruits, vegetables, and legumes from plants pollinated by bees is more than ten times the value of honey production.
- There are nearly 11,000 beekeepers in Canada.
- Each time a honeybee leaves the hive to seek food, it visits 50 to 100 flowers.
- Mead is the name for wine produced from fermented honey.
- A single colony of honeybees is enough to pollinate an entire acre of fruit trees.
- Alberta, Saskatchewan, and Manitoba are the Canadian provinces that produce the most honey.
- There are no African honeybees in Canada.
- Honeybees are responsible for the pollination of a third of Canada's food-producing crops.