Science Unit: ***Plants 'n' Bugs***

Lesson 2: ***Insects around Us***

School year:	2008/2009
Developed for:	False Creek Elementary School, Vancouver School District
Developed by:	Shona Ellis (scientist), Angela Cotter and Geraldine Miles (teachers)
Grade level:	Presented to grades 2; appropriate for grades 2 – 5 with age appropriate modifications.
Duration of lesson:	2.5 hours
Notes:	Insect can be collected in advanced and presented living or dead (pinned). Entomological Museums or societies may have collections for loan that will supplement the lessons. There are many books with excellent pictures to show the students.

Objectives

1. Review the parts of flower.
2. Understand the roles of insects in the world.
3. Understand the importance of insects to plant reproduction.
4. Observe and document the parts of a flower
5. Be able to distinguish between the main groups of insect pollinators (bees, wasps, moths, butterflies, hoverflies).
6. Identify the general features of insects and how they facilitate their roles in the world.

Background Information

Many children know a lot about insects; they can often distinguish insects from other arthropods, name the parts of an insect, and know the main types of insects. Discussing the body parts and general structure of an insect is an excellent way to start. By the end of this lesson they will be able to identify by sight: bees, wasps, butterflies, moths, hoverflies, beetles, as well as understand how different insects get their nutrition. The structure of their mouthparts reflects the different modes of nutrient acquisition: sucking, biting/chewing, sponging.

Vocabulary

Word:	
Decomposer	An organism that feeds on and breaks down dead animal or plant material (usually refers to fungi and bacteria)
Detritivore	An organism that feeds on and breaks down dead animal or plant material (refers all organisms from bacteria to snails)
Pollinator	An organism that transfers pollen from an anther to a stigma
Herbivore	An animal that gains its nutrition from plants.
Carnivore	An organism that gains it nutrition from animals.

Antenna	Appendages on the head
Mandibles	Chewing mouthparts
Proboscis	Elongate mouthparts
Head	Body part that have eyes, mouthparts, and antennae (in insects)
Thorax	Body part to which legs and wings are attached (in insects)
Abdomen	Posterior body part (in insects)
Legs	Body parts used for walking
Wings	Body parts used for flying
Compound eyes	Eyes made up of multiple visual units
Ocelli	Simple eyes usually made up of a few sensory cells and a single lens (usually in threes on the head of insects)
Reward	Benefit provided for a service (nectar, pollen, and fragrances are rewards to pollinators)
Spiracles	Pores in the exoskeleton of insects that allow air to access the trachea (air tubes for breathing)
Exoskeleton	External casing of insects
Haemolymph	Blood system of insects
Larva	Juvenile stage
Egg	A female gamete (ovum)
Pupa	Non-feeding stage between larva and adult in some insects
Adult	Final developmental stage which reproduces

Materials

- Insect specimens (may be collected and mounted or borrowed)
- Books
- Puppets
- Handlenses
- Sponge
- Sugar cubes
- 2 Juice boxes
- Party favour (blow and uncoils)
- Pliers
- Plastic insect toy (small)
- Hypodermic syringe (without needle)
- Small pouch of ketchup
- Plastic straw

In the Classroom

Introductory Discussion

1. Discuss with the students what they already know about insects and relation to other animals. A variety of insects and pictures are available for them to look at.

2. Review the structure of a flower from last day. A flower model with a bee hand puppet work well for making the connection between the plant and the insect.
3. This lesson will involve observation and applying knowledge learned in the classroom to a natural setting.
4. Safety guidelines:
    - Remind students that insects are living creatures and should be handled with care.
    - Find out if anyone has any insect bite allergies. If so then they should be given an alternative activity for the outdoor observation component to this lesson. When we go outside instruct students to stay a safe distance from the insects they are observing.

Science Activity

Activity Title: Insects around Us

Purpose of Activity: To identify the features that distinguish insects from other arthropods and to identify how their mouthparts facilitate their roles in the environment. Be able to identify an insect to major group (bee, wasp, etc.).

Methods and Instructions:

Set-up prior to experiment:

Have insects ready for viewing. They may be in jars with food or dead and pinned. If pinned samples are presented be prepared to explain how you prepared it.

Booklets made up with clipboards if available.

Part 1 – Introduction – in large group

Part 2 – Categorize Insects by what they Eat – in large group
Students will help compose a list on the chalkboard or flipchart.

The students will identify the different roles insects play in the environment:
Pollinators, Decomposers, Herbivores, Carnivores

Categories of Insects and how they get their food):
Pollinators – suck (butterflies), sponge (flies)
Decomposers – chew (termites)
Herbivores – chew (caterpillars), suck (aphids)
Carnivores – chew (beetles), pierce and suck (mosquitoes)

Use models/pictures to demonstrate different methods of feeding and examples.
Suggestions:
Sponge/sugar cubes – sponging (fly)
Party favour/juice – sucking (butterfly, moth)
Pliers/insect toy – chewing
Straws/juice – sucking (bee)
Hypodermic syringe/ketchup (blood) – piercing and sucking (mosquito)

Teacher's guide:

ECOLOGICAL ROLES	WHAT INSECTS EAT	TYPE OF MOUTHPARTS	EXAMPLES
Pollinators	Pollen Nectar (Waxes)	Chewing Sucking or lapping (use legs)	Bees Bees, butterflies, moths, hoverfly
Detritrivores - Decomposers	Dead material	Chewing, sponging	Wood bugs? termites
Herbivores – plant pests	Plant parts (roots, stems, leaves) by chewing Sap	Chewing Sucking	Caterpillars Aphids
Carnivores	Other insects Other animals	Piercing and sucking Grabbing and Chewing	Mosquito Preying Mantis

They may also include omnivores – which feed on both animals and plants (as well as their debris)

Discussion:
Use books to help children distinguish between the different types of insects:
bees, wasps, moths, butterflies, hoverflies, beetles

The hoverfly will likely be unfamiliar to many of the students, but flying pattern (hovering), sponging mouthparts, and the one pair of wings are good characters to distinguish them from the other insects.

What is an insect?
Draw the overall body plant on the board and ask for help labeling it with the following parts:
Abdomen, Antenna, Compound eyes, Head, Legs, Mandibles, Ocelli, Thorax, Wings

How do insects differ from humans?
Some possible answers:
- Insects have spiracles, exoskeleton, haemolymph, the way they smell (with feet and antennae)
- Insects have exoskeleton (shell on the outside) humans have endoskeleton (on the inside),
- Insects have haemolymph (blood not in veins), humans have circulatory system of veins, etc.
- Insects smell with feet and antennae, humans have noses
- Insects taste with feet and antennae, humans have noses and taste buds in their mouth

<u>Part 3 – Label the parts of an Insects – individually with worksheet</u>
Worksheet:
List body parts, label the bee drawing, ask students which insect they find the most interesting and why, and finally write down a question they have.

<u>Part 4 – Answer questions – in large group</u>
- If time permits answer questions, if not select 5 questions to address and the rest can be researched in the library or online.

Ask: What stage of the life cycle of an insect have we been looking at?
(Adult, unless also have talked about caterpillars)

Discuss Adult vs Juvenile stages – ask students for examples (caterpillars)
- illustrate butterfly lifecycle using books
Egg → Larva → Pupa → Adult

Draw adult with guidance from students:
How many legs? Where are they attached?
How many wings? Where are they attached?

Etc
Contrast this with the structure of the larval stage (pictures from a book or samples brought in).

Review modifications an insect has to facilitate pollination (not to be confused with mouthpart modification for acquiring the reward - pollen or nectar). Pollen must be able to stick to the pollinator – therefore most pollinators have hairs on the body.

Part 5 – Observing Insects/Plant Interactions – in small groups outside
Students take activity booklet outside to observe pollinators in action.
They will also document any other interactions they observe between insects and plants.

They watch some flowers and then do the following as indicated for three insect pollinators:

Name insect pollinator.
Describe or draw the insect (label)
Does the insect land on the flower?
What reward does the insect get?
How does the insect collect its reward?
Draw the flower and label the parts. Colour your drawing.

On the final two pages:
- identify other insects on a plant and explain what they are doing on the plant.
- ask questions

Closure Discussion (this will depends on if there is time after the outdoor activity)

1. Students share their observations:
   - What types of pollinators - may point out that wasps may not be good pollinators and most beetles (you can point out that they are not very hairy and they have mouthparts that are geared toward chewing).
   - Describe the flowers visited (colour, presence/absence of nectary guides, nectar).
2. Did they find other insects that are not pollinators?
3. Ask them if they saw a correlation between flower colour and pollinator. Do they think that certain colours attract different pollinators? Preview what will be coming up next day – we will investigate the importance of colour for pollination.

References

1. <http://www.cnr.berkeley.edu/citybugs/insectBasics/basics.html> City Bugs. UC Berkeley College of Natural Resources. [Insect Basics] Accessed Sept. 3, 2004.

Extension of Lesson Plan

1. Booklets are sent home with students. Instructions are on the inside front cover so if students take the booklet home the parents can help them with their pollination observations.

2. Additional lessons on other insect –plant interactions can be introduced into the program.

Suggestions:
A. Insectivorous Plants:
Many nursery and plant shops sell carnivorous plants. They are generally classified based on the type of trap they produce (snaptrap, pitfall, sticky, bladder, etc). Handlenses are excellent tools for getting a close look at special structures such as the tentacles of a sundew and the contents of a pitfall trap.

Questions to ask:
Why do some plants eat bugs?
How doe the plant attracts, traps, and digests its prey. (Note: It all involves modification of leaves.)
How does the plant prevent the pollinator from being consumed? (Different height than the trap. Different insects act as pollinators and dinner.)

Activity:
- Examine the different types of traps
- Match the trap types with specific plants (pitfall, snap, sticky, bladder)
- Examine the contents of traps.
- Examine tentacles

STATION 6: "PESKY" INSECTS – GEORGE

B. Insect "Pests"

There are many different ways insects pester humans. One way is causing damage to plants (crops, houseplants, etc). Others would be very interesting to explore with the students (fleas, bedbugs, lice, etc).

How do insects damage plants? – chewing and sucking causes physical damage, as well as diseases when the insect damages a plant and bacteria, viruses, and fungi can infect it.

Materials:
- Info sheets about specific organisms that will be taught about.
- Samples of pests (in examining jars).
- Handlenses or Dissecting scope

Activity:
- Ask students what they know about insect pests?
- Categorize them based on habitat
- Examine the pests and the damage they cause with handlenses or dissecting microscope if available.

Categories with some possible examples:

Outdoor Pests
- Aphids
- Tent caterpillars
- Wasps
- Ants
- Mosquitoes
- Wood borers

Indoor Pests
- Cockroaches
- Silverfish
- Bedbugs
- Carpenter ants
- Carpet beetles
- Flour beetles
- Drugstore beetles

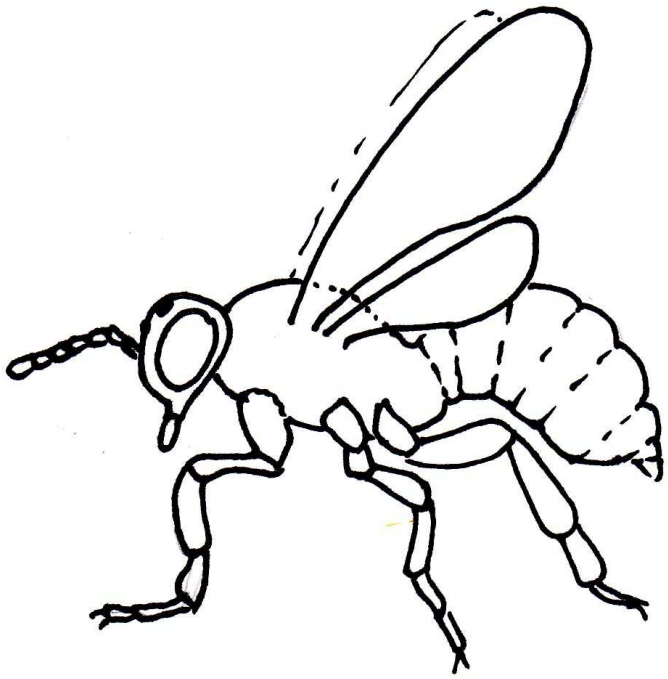
Houseplant Pests
- Aphids
- Mealybugs
- Locusts
- Spidermites

Thrips
Scale insects

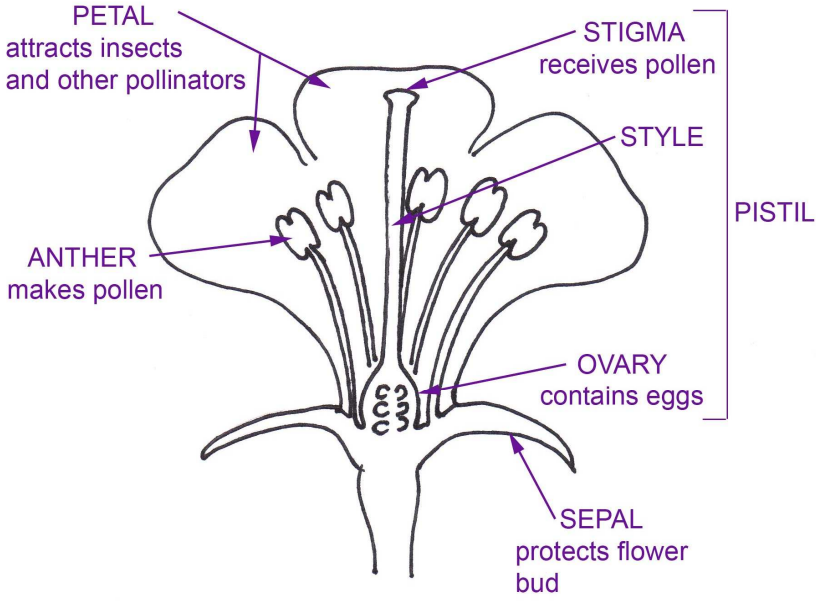
How do we control pests?
Chemicals (chemicals, soap)
Biological controls - other insects (or animals) that eat them! A good example and easy to obtain is the ladybird beetle.

Name: _____

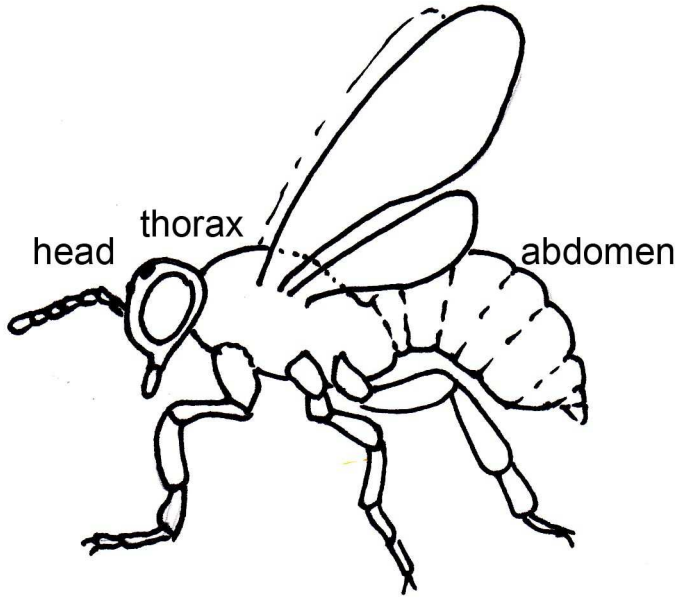
LESSON 2 – WORKSHEET

Name the parts of an insect:	**Label the diagram of a Bee**
_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	
What is your favourite insect? Why?	**Questions I have:**

Parts of a Flower:



Parts of an Insect:



_____'S
POLLINATION OBSERVATIONS

INSERT ILLUSTRATION

2009

DID YOU SEE OTHER INSECTS ON THE PLANTS?

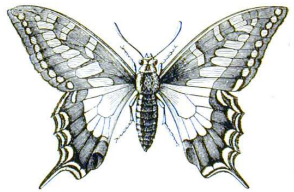
WHAT WERE THEY DOING ON THE PLANT?

DRAW OR DESCRIBE THE INSECT.

INSECT POLLINATORS

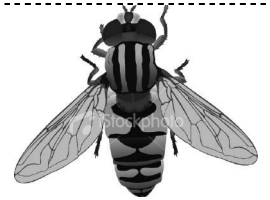
1. Bees

2. Butterflies

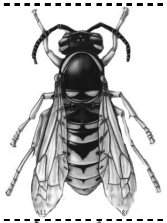


3. Moths

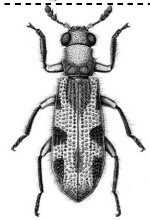
4. Flies
   (hoverfly)



5. Wasps



6. Beetles



INSECT POLLINATOR 1

Name the insect pollinator _____

Describe or make a labeled drawing of the insect.

Does the insect land on the flower? _____

What reward does the insect get?

How does the insect collect its reward?

Draw the flower and label the parts. Colour your drawing.

INSECT POLLINATOR 2

Name the insect pollinator _____

Describe or make a labeled drawing of the insect.

Does the insect land on the flower? _____

What reward does the insect get?

How does the insect collect its reward?

Draw the flower and label the parts. Colour your drawing.

INSECT POLLINATOR 3

Name the insect pollinator _____

Describe or make a labeled drawing of the insect.

Does the insect land on the flower? _____

What reward does the insect get?

How does the insect collect its reward?

Draw the flower and label the parts. Colour your drawing.

Booklet Instructions:

Look for pollinators in action! There is space in this booklet to write observations for three insect pollinators.

Watch an insect that is pollinating a flower and make observations.

For each insect pollinator:
- Name the type of insect (bee, butterfly, moth, wasp, fly, or beetle)

- Describe or make a labeled drawing of the insect.

- What reward is the insect getting? How does it collect its reward?

- Make a drawing of the flower. Label the parts.

- Did you find other insects on the plants?

QUESTIONS I HAVE: