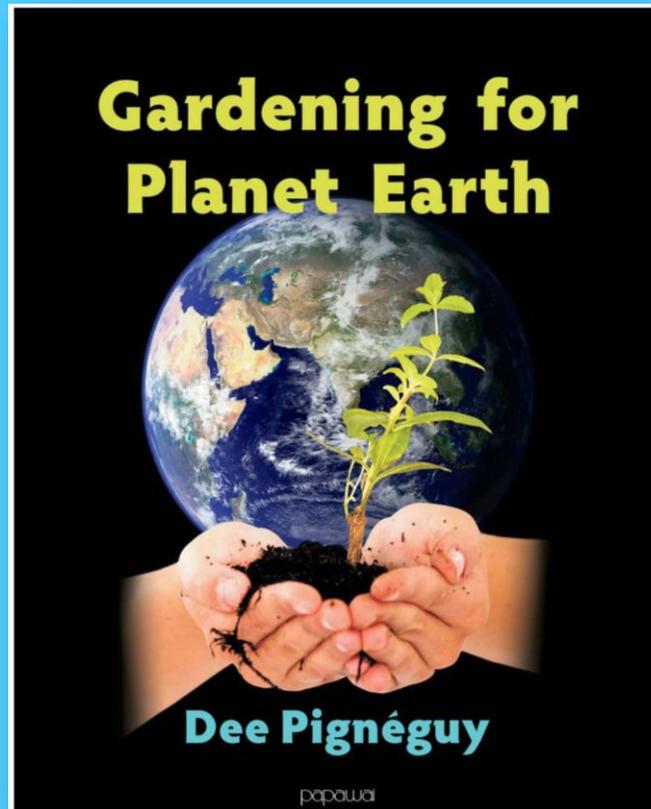


GARDENING FOR PLANET EARTH

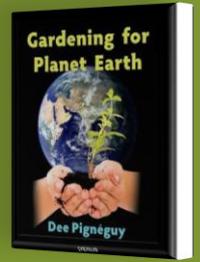
Educational Resource



Educational Resource written by Maria Gill, 2009

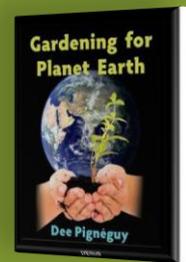
www.feedmeright.co.nz

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CURRICULUM NOTES



SCIENCE

Nature of Science: Investigations in Science

- Level 4 - Build on prior experiences, working together to share and examine their own and others' knowledge.
- Level 4 – Ask questions, find evidence and carry out appropriate investigations to develop simple explanations.
- Level 5 – Show an increasing awareness of the complexity of working scientifically, including recognition of multiple variables.
- Level 5 & 6 – Develop and carry out more complex investigations, including using models.

Living World: Ecology

- Level 4 - Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.

Living World: Life Processes

- Level 5 - Identify the key structural features and functions involved in the life processes of plants and animals.
- Level 6 – Relate key structural features and functions to the life processes of plants, animals and micro-organisms and investigate environmental factors that affect these processes.

Levels: 4 – 5 Years: 7-10

Duration: 4-6 weeks

EDUCATION FOR SUSTAINABILITY

- Aim to improve the environment
- Change students behaviour, attitudes and values towards the environment

KEY COMPETENCIES

- Thinking
- Relating to others
- Participating and contributing
- Managing Self

ASSESSMENTS

- *Observations*
- *Sample of work*
- *Completed projects*
- *Quizzes and crosswords*
- *Changed behaviour*
- *Motivation*



Organic Gardening

LEARNING INTENTION

Students can:

- * recall what they know about organic gardening
- * compare and contrast organic and conventional gardening

INTRODUCTION:

- * Teacher holds up Dee's book and says to class: Is anyone familiar with Dee's books? What do you think the author means by 'Gardening for Planet Earth'.
- * Teacher asks class, if I was going to grow this plant (holds up seedling) what would it need? Students will hopefully say: soil, water, sun, food. Teacher adds those to a pot with seedling.

LEARNING ACTIVITIES

- * Students draw a picture of a seedling, label it and say what it needs to grow organically. (This is their pre-knowledge test)
- * Students compare and contrast organic farming to conventional farming. Find information about the [two farming methods](#)

ORGANIC FARMING	CONVENTIONAL FARMING
<ul style="list-style-type: none"> * Foster health of consumer, soil, environment * User natural fertilisers * Rotate crops 	<ul style="list-style-type: none"> * Foster profits * Use chemical fertilisers * Keep crops in same area

- * The Taste Test – bring some organic and conventional fruit to school. Cut them up and place on different places. Ask students to guess which is which.

MATERIALS

Gardening for Planet Earth book
Seedling, pot, soil, water
Compare & Contrast chart on board or photocopied
Conventional and organic food

CURRICULUM CONNECTIONS

GRAPHICS: Introduce lesson with some [comic strips](#). Students draw a comic strip about organic gardening.

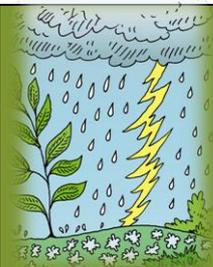
SCIENCE: In groups, students hypothesise whether an organic seed or a conventional seed will grow the fastest/healthiest. Students carry out their experiment, keeping a log of the two seeds progress.

LANGUAGE/ART: Students keep a Journal recording what they are learning, sketches of plants/insects, diagrams of life cycles, growth rates, reflections throughout educational unit.

ORAL LANGUAGE: Students debate whether organic or conventional gardening is best

HOMEWORK: Students survey their garden and draw a plan of the plants they have growing (include compass points).

ASSESSMENT: Students find relevant information in order to compare and contrast organics.



Cycles of Life

LEARNING INTENTION

Students can:

- * Access prior knowledge about the cycles of life
- * Acquire new information and then report and recall
- * Examine soil and classify the different types

INTRODUCTION:

- * Students THINK/PAIR/SHARE what the cycles of life are in the garden. First they think to themselves on the topic, then they pair up with another student to talk about it, then they share their thoughts with the class.

LEARNING ACTIVITIES

- * Using the JIGSAW method, divide the class into 5-6 person groups, one person taking on the role of the leader in each group. Team members assign themselves numbers: 1,2,3,4,5. Teacher asks person #1 from each group to go to Segment 1, person #2 from each group to go to segment 2, etc. The segments are on five different tables with photocopied pages: 5,15,18,19,20 from book. Students in segment 1 reads page 5 twice. Students in segment 2 reads page 15 twice etc. Once all groups have finished reading give them time in their segment groups (for example all person 1's) to summarise the points. Students go back to their original groups and present the key points they have learnt from their segment. Encourage others in group to ask questions. Leader ensures no one dominates. Afterwards, quiz students on information.
- * Put some different types of soil (peat, clay etc.) on tables and students examine with microscopes. What micro-organisms can they see? Students draw them and then try to name them: bacteria, fungi, viruses, nematodes, mites, springtails, protozoa etc. Talk about why the soil samples are different and why they hold different micro-organisms. Classify the different soil samples: humus, loam, sand, gravel, clay, peat
- * Students draw a flow-chart of a life cycle. Examples in book.

MATERIALS

Gardening for Planet Earth book
Photocopy pages: 5,15, 18,19, 20; different types of soil

CURRICULUM CONNECTIONS

SCIENCE: Students investigate Pascal's Law. Then watch an earthworm crawling. Then carry out this water [experiment](#) . Carry out the '[Look Mum No Dirt](#)' experiment.

LANGUAGE/ART: Come up with a slogan/logo for caring for the soil i.e. 'Don't treat soil like dirt'

HOMEWORK:

Students start composting at home. See how on page 8. Observe it every week and record observations in Nature Journal. Is it warm or hot? Does it stink or not? Is it getting bigger or smaller?

LINKS

www.jigsaw.org/steps.htm
www.wisegeek.com/what-is-pascals-law.htm
Information about microbes:
<http://commtechlab.msu.edu/sites/dlc-me/zoo/zdmain.html>
Look Mum No Dirt experiment:
<http://home.howstuffworks.com/science-projects-for-kids-soil-experiments3.htm>

ASSESSMENT: Students can name different soil types, micro-organisms and can draw a flow chart of the life-cycles



Fertilising

LEARNING INTENTION

Students will:

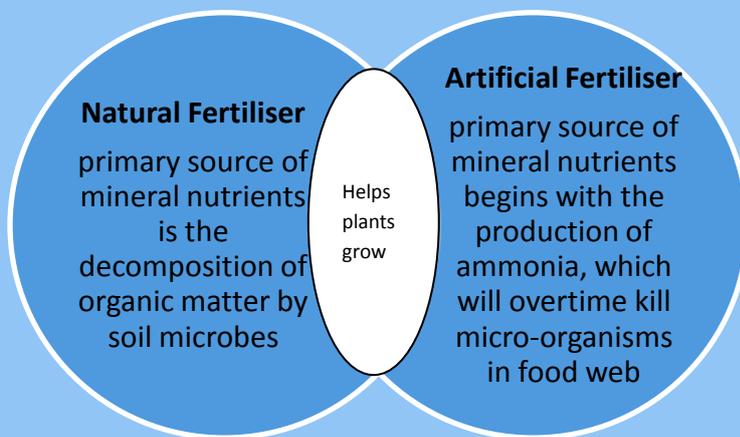
- * Investigate the different types of fertilisers and compare natural with artificial.

INTRODUCTION:

- * Brainstorm what fertilises plants. Ask students whether fertilisers extend a plant's life.

LEARNING ACTIVITIES

- * Teacher tells students that plants grown organically receive nutrients naturally from compost, manure, liquid fertilisers, green manure and recycled plant materials. Students find out about natural fertilisers (see page 27 – 29). Once they have their information students draw a Venn diagram on natural vs. artificial fertilisers. Example:



- * Students in pairs/groups set up a QHORC experiment on different fertilisers: first they ask a **question**, then **hypothesise** what the results will be, **Observe** the changes, **research** the question then write their **conclusion**. See Template One for example and chart.

MATERIALS

Gardening for Planet Earth book
Template One for each student
Different types of fertilisers
Pot plants, soil, water

CURRICULUM CONNECTIONS

SCIENCE: Which Wastes Rot

1. Take two pieces of: glass, paper, steel, plastic and apple.
2. Hypothesise which will rot within a month.
3. Half fill five pots with soil from garden.
4. Half fill another five pots with sterile potting mix.
5. Put 1x glass into soil, other glass in sterile potting mix. Continue with other: plastic, paper, steel, apple.
6. Fill containers up with soil and water until damp.
7. Cover all 10 containers with plastic wrap and label i.e. soil with glass.
8. Examine waste in each container after one week. Which are rotting? Record on graph. Continue rechecking and graphing every week.

HOMEWORK: Make some liquid compost for your garden. Write up your recipe and share it.

ASSESSMENT: Students can compare and contrast natural vs. Artificial fertilisers, and investigate which fertilisers work best



Pollination

LEARNING INTENTION

Students will:

- * Investigate how plants are pollinated then apply that knowledge to name the parts of a flower and hypothesise what would help it pollinate.

MATERIALS

Gardening for Planet Earth book
Collection of flowers
Microscopes
Glue or cellotape, tweezers
Template Two

INTRODUCTION:

- * Teacher asks students to look at a collection of flowers (collect different shapes i.e. trumpet, small, big, etc.) closely. In groups, students discuss how plants pollinate. How they attract insects and the importance of colour/smell.

CURRICULUM CONNECTIONS

SCIENCE: Students label a diagram showing the parts of a flower.

LANGUAGE/ Write a 'what if' scenario – if bees became extinct how could plants attract other insects/animals.

ART: Students design a flower that will attract insects – thinking about colour, markings etc.

LEARNING ACTIVITIES

- * In pairs, students write down a question they want to find out about pollination. Students then take turns reading pages 30-33 (could be up on OHP, or scanned on projector or photocopied). Afterwards, students tell their partner whether they have answered the question and whether they need to look further to answer it. Teacher asks students to share their Q & A to class.
- * Now students are familiar with parts of flowers and their functions, students in pairs select a flower to study. Students first look at it with a magnifying glass. Next ask them to dissect their flower into parts (starting from outside and moving inwards). Then they can stick the parts onto a piece of paper and label. Finally, ask the students to conclude what would pollinate their flower (insect, wind, animal). Students need to research (book, web and expert) to find out if they are correct.
- * After students have looked at the different flower presentations (above) ask them to compare and contrast the structure and function of the flower parts. Group the plants into insect pollinated, wind pollinated and animal pollinated. Ask the students how the stigma of each flower adapted to trap pollen. Is one method of pollination more common? Why? Compare the number of each flower part among flowers studied – was there a pattern? Classify each flower as a monocot (floral parts in multiples of 3) or dicot (floral parts in multiples of 4 or 5).

HOMEWORK: Students find in their garden an example of plants that attracts three different types of pollinator. Sketch the plant and their pollinator.

LINKS

Watch a video link on pollination:

www.neok12.com/php/watch.php?v=zX604d6f4771457c436c5902&t=Pollination

ASSESSMENT: Students successful label their flowers parts and find out what pollinates it.



SEEDS

LEARNING INTENTION

Students will:

- * Investigate how seeds are dispersed and understand the variety of ways they can.

MATERIALS

Gardening for Planet Earth book
Seeds: swan plant seed (wind dispersal), fruit or vegetable seed, nut seed, a seed with hooks on it so it can attach itself to an animal,

INTRODUCTION:

- * In groups of 5/6 students examine the seeds in front of them and group them by the way they disperse themselves. For example, are they eaten, dispersed by wind or propulsion, brushed off by an animal, gravity causes them to drop on ground, or float in water.
- * Watch a You Tube [Video](#) on seed dispersal

CURRICULUM CONNECTIONS

SCIENCE: Students grow some seeds and sketch the life cycle in their journal. Students could also test conditions that encourage or hinder their growth.

LEARNING ACTIVITIES

- * Students read page 47 and this [site](#) to see if they are correct.
- * Set up seeds with microscopes (grouped into their method of dispersal – for example: coconut – water; grass, dandelion, ash – wind; burr – burdock; mechanical – wisteria; watermelon, pumpkin, tomato, acorn, apple – animal feeding on it). Students need to:
 1. Describe the seed's characteristics.
 2. Sketch a diagram of the seed.
 3. Label the diagram with seed parts.
 4. List conditions in its habitat that affects seed dispersal
- * Give each student a dry seed and ask students to design a wind-dispersal seed mechanism for it. Students need to remember it needs to move a distance in order to move away from parent plant. They can use feathers or paper, tape or glue. Then students drop their seed designs from the same height in front of a fan (several times). Then measure the distance (find an average after 3rd time). Evaluate why the seed that travelled the furthest worked so well. Students improve their design then retest.

LANGUAGE: Write a creative non-fiction piece in the day of a life of a seed.

HOMEWORK: Students walk around an area with moist soil in shoes with ruts. Afterwards remove the soil on boot and place into container with a bit of water. The next day add it to a pot of soil and see what grows. Record results in nature journal.

LINKS

Seed dispersal site:
<http://theseedsite.co.uk/dispersal.html>

ASSESSMENT: Students can classify the different types of seed dispersal.



Creatures in Our Garden

LEARNING INTENTION

Students will:

- * Discover the different types of creatures in the garden and identify which are friend or foe.

MATERIALS

Gardening for Planet Earth book pages 34-40
Scavenger Hunt cards

INTRODUCTION:

- * Teacher shows students a series of photographs: pollinators, parasites and predators. Students hypothesise which ones are beneficial in the garden and which are not.

CURRICULUM CONNECTIONS

SCIENCE: In the Nature journal identify and draw a variety of insects.

LEARNING ACTIVITIES

- * In small groups name other insects and group them into the three Ps.
- * In pairs, students choose an insect to investigate using pages 34-40 from book. Answer these questions:
 1. Is it a pollinator, parasite or predator?
 2. Is it helpful or not?
 3. What does it eat?
 4. What does it predate?
 5. What can deter it?
 6. What can attract and shelter it?

DESIGN: Design a vegetable garden that will also have plants that attract and repel creatures.

ORAL LANGUAGE: Assign students different roles; pollinator, parasite or predator. Students in 3s roleplay how they can co-exist.

Title it: Friend or Foe, draw a picture of the insect and label its parts. Draw a diagram of its life-cycle. Show how it is part of an eco-system.

HOMEWORK: Students investigate their garden for three Ps. (Suggest they also look at night with a torch too.) Students chart results.

- * Visit a garden and scavenger hunt the following:

Find a plant that repels pests	Find a plant that attracts good creatures	Find a predator
Find a parasite	Find a pollinator	Find out what product the gardener uses to get rid of parasites

LINKS

Pictures and information about creatures in our garden:
www.dgsgardening.btinternet.co.uk/insects.htm

- * Invite a gardener into the classroom (that has photographs to show) and prepare questions about the creatures they have in their garden and how they nurture and repel them.

ASSESSMENT: Students can classify different creatures into 3 Ps. Students also understand that the 3 Ps are part of the eco-system and we can work with nature or against it.



Plant Protection

LEARNING INTENTION

Students will:

- * Students will problem solve in the garden.

MATERIALS

Gardening for Planet Earth book
Pages 55, 56, 60
Problem Solution chart
Template Three

INTRODUCTION:

Show students video of problems in the garden or show photographs of common problems. Ask students what caused them.

CURRICULUM CONNECTIONS

SCIENCE: Students will learn how strong and resilient plants are with this experiment:

Need: beans, water, Plaster of Paris, aluminium pan

To Do: Soak beans in water overnight. Pour 5cm of Plaster of Paris into pans. Sprinkle beans across top then pour in over top another 5cm of Plaster of Paris. Watch what happens over a week. The beans will sprout, forcing themselves through the rock-like Plaster of Paris.

LEARNING ACTIVITIES

- * Tell students that gardeners have to problem solve all the time; birds try to eat vegetables, insects attack plants, plants can get diseases etc. Students use Gardening for Planet Earth book to research problems and solutions for gardeners and fill out the chart:

PROBLEM SOLUTION CHART ON PLANT PROTECTION

PROBLEM	ORGANIC SOLUTION	CONVENTIONAL SOLUTION
Example: Slugs eat cabbage leaves	Go out with torch at night and collect snails.	Put down slug pellets
Birds eat tomatoes	Put bird netting over tomato plants	Shoot birds or put down poison
Potatoes rot if kept in same place	Next year plant legumes there instead.	Plants sown in same place with sprays to prevent problems

DRAMA: Show students a clip of David Attenborough filming, then tell students they are going to do a David Attenborough style (or some other well known celebrity) video about solving problems in the garden. Show to class afterwards.

HOMEWORK: Students do a survey of their garden at home and write a report of the problems and suggestions for solutions.

- * Students write step-by-step instructions on how to get rid of a problem in the garden (using Template Three photographs).
- * Students could take 'before/after' photographs of a garden with problems, and a garden that has solved problems. Display in library or hall.

LINKS: Videos on gardening problems, create a [virtual garden](#)

ASSESSMENT: Students have identified 3+ problems and found solutions for them.



Growing Your Own Food

LEARNING INTENTION

Students will:

- * Plan, design and execute a garden in the school.
- * Journal and reflect on the gardening process.
- * Students will transfer what they have learnt and use it to plan the school garden.

MATERIALS

Gardening for Planet Earth book, Teacher will need to have received permission to plant garden and found funds for it. Seeds, potting soil, wood, nails, watering cans, potting trays, worm and compost bins

INTRODUCTION:

Ask the students to brainstorm what they would have to do before planting a garden: choose the right site, getting the tools, preparing the soil etc. (see page 41).

Tell them they are going to start a garden in their school (outside of classroom or somewhere else in school) and they will need to plan it.

CURRICULUM CONNECTIONS

SCIENCE: Using Dee's recipes students make some compost teas and garden sprays; testing which are most effective.

ART: Students make murals and sculptures to complement their garden.

TECHNOLOGY: Students make things to use in the garden: garden seat, raised garden beds, bird bath, something to scare off birds, trap parasites etc.

LEARNING ACTIVITIES

- * As a class plan and design a garden for the school. Ask experts to come in so children can get advice and feedback.
- * Organise the students into different groups:
 - Group 1: Soil Saviours – prepare soil and keep it nurtured and mulched.
 - Group 2: Seed Saviours – plant and care for seeds/seedlings
 - Group 3: Composters – organise compost bins or worm bins.
 - Group 4: Orchardists – will plant and care for orchard.
 - Group 5: Water Warriors – will organise watering system.
 - Group 6: Admin Team will work out finances, organise parent help (to build raised beds if needed),Groups will work together at times.
- * Students will keep a Nature journal throughout reflecting on what has worked and what hasn't. Also, commenting on how they would problem solve problems such as plant protection, watering in a dry season etc.
- * Students plan a meal with the crops they have grown and cook it for class to share.

HOMEWORK: Students transfer the skills they have learnt in class to organise their family to have a garden (or grow food in pots).

LINKS: [Dee Pignegy](#) can give advice to students on planning a garden.

ASSESSMENT: Students share in planning, can cooperate in groups and reflect on what worked.



RESOURCES

BOOKS

Earth Users Guide to Permaculture by Rosemary Morrow (Kangaroo Press, ISBN 0864175140)

Living the Good Life by Linda Cockburn (Hardie Grant Books, ISBN 1740663128)

Natural Control of Garden Pests by Jackie French (Aird Books, Australia, ISBN 0 947214550)

MAGAZINES

Organic NZ

Gardening NZ

KCC – Kiwi Conservation Club

WEBSITES

www.organicnz.org – organic garden magazine

www.enviroschools.org.nz – environmental schools

www.eco.org.nz – Environment & Conservation Organisations

www.naturallysmarter.co.nz – North Shore Council environmental ideas

www.feedmeright.co.nz – Dee Pigneguy's books

For more science experiments go [here](#)

www.mariagill.co.nz – author of teaching resource

www.garden2table.co.nz – helping schools set up gardens and cooking programmes

GARDENING & HEALTHY COOKING CLASSES

Dee Pigneguy gives the following workshops or consultancies in the following:

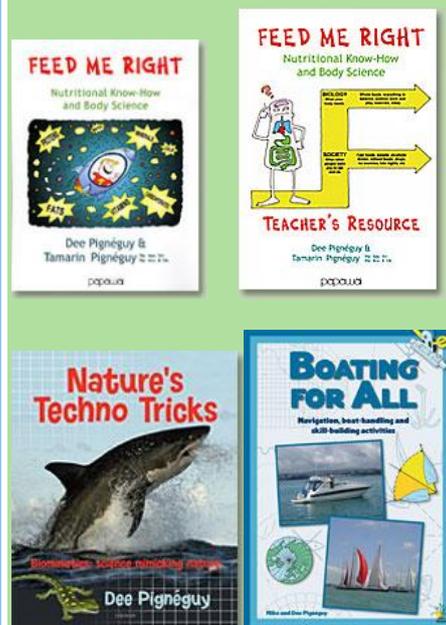
- ✓ School Garden workshops
- ✓ Gardening workshop for teachers
- ✓ Author talks
- ✓ Speaker for after-school events i.e. Healthy Eating
- ✓ Garden consultancy services
- ✓ Garden workshops

Contact Dee for further details:

mikede@clear.net.nz

Phone: 09 444 9342

OTHER BOOKS BY DEE PIGNEGUY



TEMPLATE ONE

'FERTILISING RIGHT' EXPERIMENT

Use a selection of different types of fertilisers e.g. worm castings and pee, compost, liquid manure, synthetic nitrogen fertiliser, blood and bone, manure to fertilise the same type of plant. Make sure you limit the variables i.e. put into same shape pot, water same amount, put in same place.

For Example:

Plant A – Sunflower seedling in a pot with soil and compost fertiliser.

Plant B – Sunflower seedling in a pot with soil and synthetic nitrogen fertiliser.

Plant C – Sunflower seedling in a pot with soil and liquid manure.

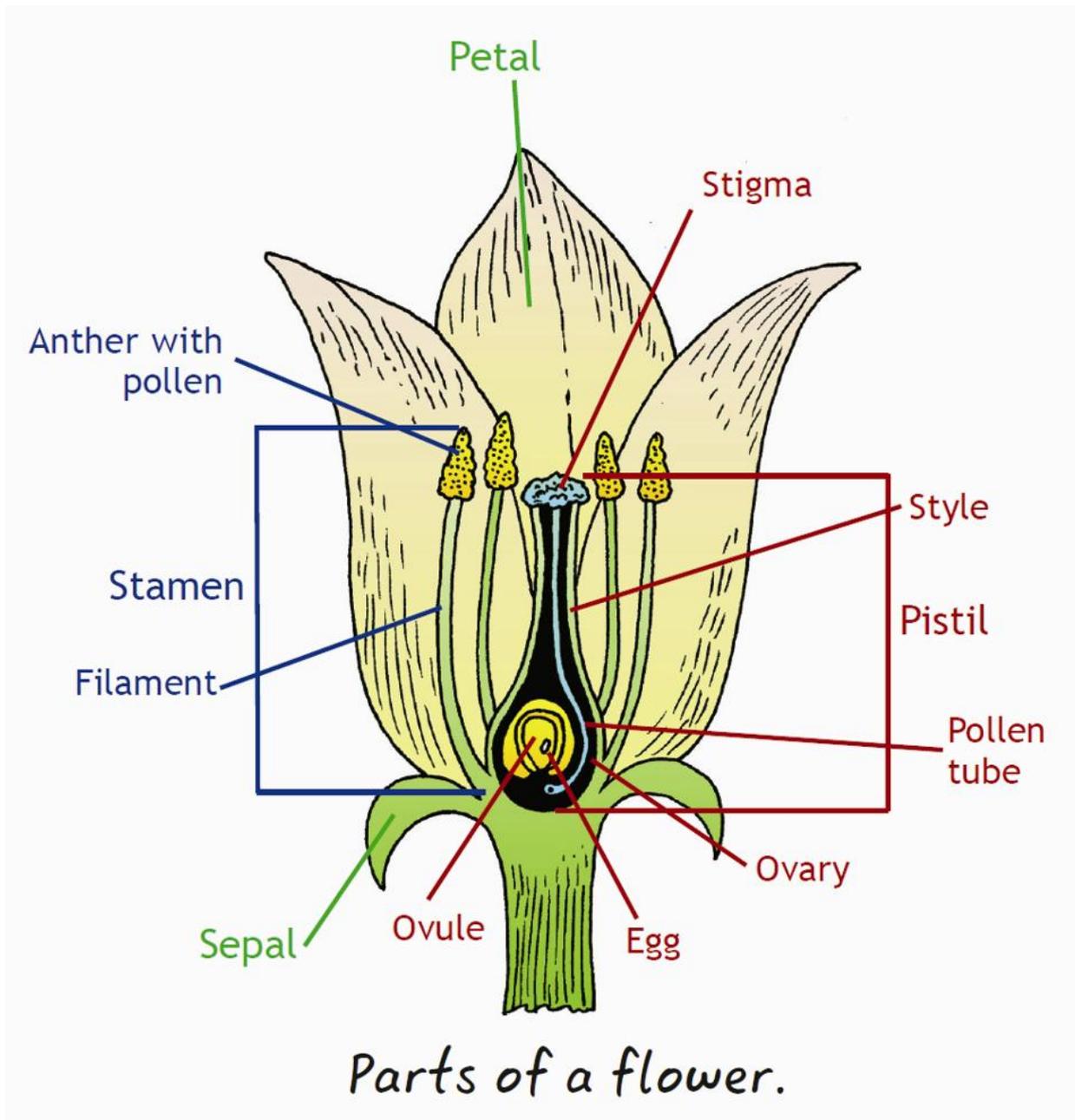
Plant D – Sunflower seedling in a pot with sheep pooh.

Variation: Some students may wish to find out what is the best mix of fertilisers i.e. Plant A - compost/worm juice/sheep pooh; Plant B – synthetic nitrogen fertiliser/ triple super phosphate; Plant C – blood and bone, lime and sheep pooh; etc.

TITLE: FERTILISING RIGHT

<p>Q</p> <p>QUESTION</p>	<p>Which fertiliser will be the most effective fertiliser?</p>
<p>H</p> <p>HYPOTHESISE</p>	<p>I hypothesise that the fertiliser will be most effective because it</p>
<p>O</p> <p>OBSERVE</p>	<p>I observed in week one that Plant A grew but it was a bit, plant B, plant C.... In week two Plant A.... In week three plant A....</p>
<p>R</p> <p>RESEARCH</p>	<p>In Pigneguy's book 'Gardening for Planet Earth' I found that In website I learnt that ... After talking to gardening expert ... I discovered that...</p>
<p>C</p> <p>CONCLUSION</p>	<p>The most effective fertiliser was/not the fertiliser I had hypothesised... This is because (research comes in here) and I observed (backs it up) Therefore I conclude...</p>

TEMPLATE TWO



TEMPLATE THREE



1 & 2



3 & 4





5 & 6



Template 3 – Problems noted in pictures

APHIDS	FASCIATION	RUST SPOT	DOWNY MILDEW
POWDERY MILDEW	TRAVELLING LONG DISTANCE	LOOPER CATERPILLAR	MEALY BUGS

	PROBLEM	CONVENTIONAL SOLUTION	ORGANIC SOLUTION
1	aphids	Use toxic sprays	Use beneficial insects (ladybirds) or make organic sprays
2	fasciation	Caused by overuse of chemical sprays	Build plant health with compost
3	Rust spot on leaves	Spray with fungicides	Cut back all diseased leaves and burn
4	Spores of downy mildew on leaves	Spray with fungicide	Cut back diseased leaves and allow air movement
5	Powdery mildew on leaves	Use chemical sprays	Pick of any leaves that show early signs and use milk based sprays
6	Apples in trouble	Caused by shipping apples long distance	Eating in season and buying locally
7	Looper caterpillar	Use chemical sprays	Hand pick, encourage wasps into the garden
8	Mealy bugs	Use pesticides	Introduce ladybirds, spray plants with soapy water to break down waxy coating on insect