KidsGrow KidsCook

STAGE 3 LESSON PLANS

Sequence of Garden lessons:

1. Check your soil type
2. Test and Prepare Soil
3. Soil Porosity
4. What's the weather?
5. Identity and values
6. You are what you eat

Allow 50 minutes per lesson

Some lesson plans were originally developed by Dan Bakker from Bournda Environmental Education Centre and these were adapted by Healthy Kids Association.

Check Your Soil Type - Stage 3

Title: Soil Porosity & Structure (Links to Step 6 of KidsGrow KidsCook resource. Check your soil type. Test and adjust soil properties if necessary.)

Aim: Students will investigate the properties of different types of soil within the garden before considering and applying remedies.

Outcomes	Indicators
INVS3.7 Conducts their own investigations and makes judgments based on the results of observing, questioning, planning, predicting, testing, collecting, recording and analyzing data and drawing conclusions.	• Analyse different soil types and concludes what properties make for the best soil for their vegetable garden.
LTS3.3 Identifies and describes and evaluates the interactions between living things and their effect on the environment.	• Works collaboratively to research and identifies what environmental conditions impact soil porosity and structure.
ESS3.6 Recognises that the earth is the source of most materials and resources, and describes phenomena and processes, both natural and human, that form and change the earth over time.	• Decides what remedies the soil needs to improve its productivity for good vegetable garden growth.

Resources:

- 'Types of Soil' worksheet
- sample of ideal garden soil
- sample of dry course sand
- half a cup of powdered clay (plaster will also suffice – just call it white clay)
- sample of friable clay soil
- chalk
- optional mapping of garden on paper
- garden forks/shovels
- Dirt: The Movie (www.dirtthemovie.org) or at least consider screening the website trailer. Suitable for stage 3 students.
- www.kidsgeo.com/index.php website.
- http://urbanext.illinois.edu/firstgarden/basics/dirt_04.cfm

Activity:

Demonstrate to the class the following activity and then have students complete the worksheet.

Before you start this lesson it is important to have a discussion about the importance of always washing hands when handling the soil samples.

1. Review findings and terms from the prior lesson.

2. Add to prior lesson by demonstrating friability: the capacity for soil to just 'cling' to itself – often an indicator of moderate porosity. Use the sand dry, then use water, then consider adding powdered clay for best effect. Then model the sample of 'ideal soil'.
   Ask the following questions:
   Why does this sand not hold onto itself?
   Why does the addition of water help it to cling?
   How does the clay assist?

3. Explore different sites around the school property and its garden. Collect a variety samples from 5cm under the surface of the soil and place the samples on a map of the garden chalk-drawn on concrete outside or (optional) on large sheets of paper.
   Ask the following questions:
   Why does this sand not hold onto itself?
   Why does the addition of water help it to cling?
   How does the clay assist?

4. Analyse, assess, determine and report on soil structure, porosity, friability and fertility in comparison with the 'ideal soil' sample.
   Ask the following questions:
   How does our soil's health/structure measure up?
   Will our soil condition be the same throughout the garden? No – why not?
   How might we remedy a compacted or nutrient poor soil?
   What can we do to ensure soil doesn't lose its structure in the first place?

5. With reference to the last lesson students then propose what applications might be employed to enhance the productivity of the soil (adding sand or clay or organic matter).
   Ask the following questions:
   Are there other ways to improve soil health that we are unaware of?
   How could we come to discover these strategies?
   Who could we ask?

6. Then explain how soil porosity can be lessened over time with soil sedimentation/erosion, through compaction (feet, tractors) or via the loss of organic matters (disease, mineral imbalance and pH are factors to consider later). Conversely explain how porosity can be altered through the use of chemical/organic additives or physically by pioneer plant root-growth and by hand (or foot): forks, shovels.

7. Have students reconsider their proposal.
   Apply student proposals by having them map, test and altering small samples from around the garden before physically remedying the garden on mass.
   Extension: Have students consider what can be seen and what is unseen in their garden soil.

Propose the garden had been poisoned with i.e. salt or acid, infected with a disease or depleted from overuse. Have students consider ‘asking an expert’ for advice on how to investigate what they don’t know and can’t see (i.e. the next consideration is pH testing before nitrogen and then weed-seed/disease/pests).

8. Summary:
   What can we learn from this investigation that might teach us about soil health and fertility?
   What are some significant factors to consider in the preparing and maintaining of garden soil? (structure, moisture retention, porosity, variety of ingredients, sedimentation)

Types of Soil

Name: _____

Find 3 soil samples from different sites around the school. Complete the table using the word bank .

Watery, lots of organic material, airy, lots of soil porous & quick, Solid & slow, crumbly and moderate, grainy, slippery, crumbly, sticky, high organic content, medium organic content, low organic content, sandy, clay

Soil samples	Structure	Porosity	Friability	Fertility
Ideal soil				

What remedies need to be applied to the soil samples and why?

_____

_____

_____

What needs to be applied to the soil for your Munch & Crunch garden?

_____

_____

_____

Extension; Go ask an expert for advice about your soil. Answer the following questions:

1. What is their name and what are they expert in?
2. What question do you want to ask?
3. What is their answer? Do you need to ask someone else? Explain why or why not.
4. Is their solution suitable for your school garden? Eg, may be costly and out of the question or may require tools or chemicals that you don't have access to.

Write your answers below:

_____

_____

_____

_____

Test and Prepare the Soil - Stage 3

Title: Suspend and Settle (Links to Step 6 KidsGrow-'Test and prepare the soil' and 'Investigate safe gardening practices').

Aim: to explore/investigate the components/ingredients of soil.

Outcomes	Indicators
INVS3.7 Conducts their own investigations and makes judgments based on the results of observing, questioning, planning, predicting, testing, collecting, recording and analyzing data and drawing conclusions.	• Researches in a scientific, thoughtful and ordered way to correctly identify the components of soil.
LTS3.3 Identifies and describes and evaluates the interactions between living things and their effect on the environment.	• Conducts soil experiment to its expected conclusion and identifies environmental factors that cause different soil types.
ESS3.6 Recognizes that the earth is the source of most materials and resources, and describes phenomena and processes, both natural and human, that form and change the earth over time.	• Identifies how soil is formed and predicts methods to maintain soil.

Resources:
- 'Ingredients of Soil ' worksheet.

For each small group (3-5 students)
- 1 large PET bottle (i.e. 3-4 litres)
- 1 cup sample of 'loam' (rich topsoil or an aggregate soil which will separate in a fluid)
- magnifying glass
- water

Note: For best effect: add small amounts of sand, loose clay and/or semi-decomposed organic matter to the soil sample to exaggerate composition & separation.
- Dirt: The Movie (www.dirtthemovie.org) or at least consider screening the website trailer.
- www.kidsgeo.com/index.php website. Select Chapter one: Examining the soil.
- http://urbanext.illinois.edu/firstgarden/basics/dirt_04.cfm

Activity:

Before you start this lesson it is important to have a discussion about the importance of always washing hands when handling the soil samples. Refer to 'Safety tips for learning outdoors' and 'School friendly gardening practices' in KGKC resource.

Students can watch the trailer 'Dirt the movie' and then form a group to complete the experiment activity.

1. Discuss with students what they think 'soil' is and what it is made of. Have students consider soils as 'a living thing' and also compare with a cake-mix in how it requires a certain variety and proportion of ingredients.
   Ask the following questions:
   Why is soil important?
   Is your sample alive? How/why?
   In what ways is your handful of soil similar/different to an animal or plant?

2. Provide students a sample of the rich loam and let the children examine it. Highlight the texture, moisture, and smell and look through the magnifying glasses to observe and explain colour and consistency.
   Ask the following questions:
   Which senses could we use to examine this sample of soil?
   Describe the texture, moisture, smell and colour of the soil.

3. Put a sample of soil into a large bottle with some water. Screw the lid on firmly and shake the jar until the soil is fully suspended in the water. Have students predict and justify what will happen. Now set the jar aside for at least half an hour so the contents can separate and settle.
   Ask the following questions:
   What is happening now?
   What effect has the water had on the soil?
   What effect has the soil had on the water?
   What will have happened after a few minutes?
   What might happen after a few hours.... days?

4. Later: Go back to the jar of soil and water that you set aside to observe what has happened. The soil will have separated & sedimented and the children can see the various components. They can then compare what they observe with what their predictions were at the beginning.
   Ask the following questions:
   Describe what has happened? Why?
   Compare with your prediction?
   Why did each of you come up with varying predictions?
   Students complete worksheet.

5. Next: Visit selected sites around the school to analyse the soli and determine texture, moisture, ingredients (composition) and friability (the capacity for the sample to cling to itself).

Summary:
What can we learn from this investigation that might teach us about soil health and fertility?
What are some significant factors to consider in the preparing and maintaining of garden soil? (Structure, moisture retention, porosity, variety of ingredients, sedimentation)

Teacher Resource 1

Ingredients of Soil Experiment

Student Name: _____

Working in small groups, collect the following equipment:
- 1 large PET bottle (i.e. 3-4 litres)
- 1 cup sample of 'loam' (rich topsoil or an aggregate soil which will separate in a fluid)
- magnifying glass
- water

Aim
To identify the components of soil.

Method
Put a sample of soil into a large bottle with some water. Screw the lid on firmly and shake the jar until the soil is fully suspended in the water. Now set the jar aside for at least half an hour so the contents can separate and settle. Later: Go back to the jar of soil and water that you set aside to observe what has happened.

Predict
Explain what may happen to the mixture.

_____

_____

_____

Draw and label the experiment.

Results:
Draw and label what happened to the mixture when you returned. Identify the components.

Conclusion:
Explain what happened and why? Compare this to your prediction.

_____

_____

_____

Draw the microscopic view of soil. Identify the organic material, inorganic material, air and water.

Discuss with your group and answer the following questions:
How is soil formed?

_____

_____

_____

What components make the best soil for growing your garden?

_____

_____

_____

Soil Porosity - Stage 3

Title: Soil Porosity, Fertility & Structure (Links to Step 6 KidsGrow- Test and prepare the soil.)

Aim: To investigate the properties of different types of soil so as to discover that by balancing soil structure they can enhance its capacity to retain/drain water also increase its fertility.

Outcomes	Indicators
INVS3.7 Conducts their own investigations and makes judgments based on the results of observing, questioning, planning, predicting, testing, collecting, recording and analyzing data and drawing conclusions.	• Completes soil experiment and correctly concludes the properties of different soils.
LTS3.3 Identifies and describes and evaluates the interactions between living things and their effect on the environment.	• Accurately predicts which factors will improve soil productivity.
ESS3.6 Recognizes that the earth is the source of most materials and resources, and describes phenomena and processes, both natural and human, that form and change the earth over time.	• Explains what climatic conditions will impact on soil productivity.

Resources:
- 'Soil Experiment' worksheet
- A small plant with exposed roots.
- Glass container of water

Per group
- 3 x 1 litre PET bottles pre-cut 1/3 down from top. The cut top will act as a funnel.
- in buckets, samples of 3 different types of soil:
- course sand (i.e. riversand)
- fine clay (ideally crushed potting clay) add plaster for desired effect
- ideal garden loam or potting mix mixed with soil
- Coffee filters or muslin-cloth cut into 30cm circles
- access to tap water
- Measuring jugs
- 3 paper cups
- Stopwatch
- Dirt: The Movie (www.dirtthemovie.org) or at least consider screening the website trailer. Suitable for stage 3 students.
- www.kidsgeo.com/index.php website.
- http://urbanext.illinois.edu/firstgarden/basics/dirt_04.cfm

Activity:

Demonstrate to the class the following activity and then have students form groups to complete the experiment and worksheet.

Before you start this lesson it is important to have a discussion about the importance of always washing hands when handling the soil samples.

Refer to 'Safety tips for learning outdoors' and 'School friendly gardening practices'.

1. Begin by taking a small plant and placing its roots in the glass container underwater. Question students on the probability of that plant's survival.
   Explain: porosity, retention, aeration, soil structure, compaction, friability.
   Ask the following:
   Why won't this plant survive?
   A plant's roots need water – so why will this plant suffer in %100 water?
   What else does this plant and its roots need to flourish?

2. Provide students a sample of the rich loam and let the children examine them. Highlight the texture, moisture, smell and look through the magnifying glasses to observe colour and consistency. Ask the following:
   Using your senses describe your sample of soil. Why shouldn't we 'taste' our samples?

3. Check your soil type. Test and adjust soil properties if necessary.
   Pick up a handful of moist soil and squeeze. Clay soil will form a tight sticky ball. Silt feels slippery. Sandy soil feels grainy and won't hold its shape. Loamy soil will hold its shape but it crumbles easily. Seek advice about how to improve your soil. Sand: allows for water passage thus aiding porosity. Clay: inhibits porosity by absorbing water and by filling cavities in the sand. Organic matter: in combination with sand and clay can regulate porosity and thus enable roots air, water and structure.
   Ask the following:
   What does your soil need to have changed to improve its growing properties?

4. Provide students a sample of the rich loam and let the students examine them and highlight the texture, moisture and smell. Students discuss what they think the soil is made from.
   What might be the difference between soil, dirt and loam?

5. Show the students the clay and sand and get them to verbally think/pair/share differences between them.
   What is similar/different between these samples?
   Where do they come from?
   How would they combine?

6. Measure equal amounts of the 3 samples before placing level into the coffee filters and their baskets. Measure 3 equal portions of water into cups.
   Ask the following:
   Why measure 'equal' amounts of the soils and water?
   What if we used twice the amount of one sample?
   Students then predict which sample will filter through more quickly and more slowly.

7. Add the water to the soil samples at the same time, students observe and record. Students use a stopwatch to recount and record how long it takes for the water to filter through. Record your findings. Compare results with earlier predictions and discuss probable/possible causes. Discuss the different soils' properties and how they relate-to/influence their garden's soil and fertility.
   Ask the following:
   Why should we add the water to the three samples at the same time?
   Why was the sand the fastest – 'most porous'
   Why clay the slowest – 'least porous' Why?
   Why did almost all the water pass through the sand and yet little (in some cases none) of the water passed through the clay?
   Which sample has retained most of the water?

8. Explain to the students that the water and nutrients contained in the soil provide growing plants with two of the components needed for growth - a third being light.
   Then explain how air pockets in the soil's structure balance porosity by providing room for water to accumulate while also permitting excess water to pass through: thus aiding water contact, drainage and aeration around the roots.
   Sand: allows for water passage thus aiding porosity
   Clay: inhibits porosity by absorbing water and by filling cavities in the sand
   Organic matter: in combination with sand and clay can regulate porosity and thus enable roots air, water and structure.

9. Extension: Porosity Challenge: Older students can then experiment in mixing sand and clay proportionately to meet a pouring time set by themselves or by the teacher (i.e determine the average from the sand and clay tests)
   Students can add grass seed to each of the wet samples and investigate how the seed can be sustained by each of the samples over a period of time

Summary:
- What conditions do plants need to grow?
- What type of soil is best for plants to grow in their garden?
- What needs to be done to improve their soil?

Soil Experiment for the Munch and Crunch Garden

Name: _____

Aim: To investigate the best soil properties needed for garden plants to grow.

Method: Explain how to test the texture properties of soil.

Results: Complete the following table.

Soil Type	Texture	Time in Seconds	Microscopic View
Clay			
Silt			
Sandy			
Loamy			

Conclusion:
Which soil would be the best soil for your Munch & Crunch garden? Why?

_____

_____

_____

What are the 3 ingredients plants need to grow?

_____

_____

_____

Term	Definition
Porosity	Is the measure of the open spaces or pores found within the soil. Porosity determines the total amount of water a soil with hold.
Retention	The spaces that exist between soil particles, called pores, provide for the passage and/or retention of gasses and moisture within the soil profile. The soil's ability to retain water is strongly related to particle size; water molecules hold more tightly to the fine particles of a clay soil than to coarser particles of a sandy soil, so clays generally retain more water. Clay type, organic content and soil structure also influence soil water retention.
Aeration	The amount of pore space that develops between soil particles and allows for good drainage. Plants need good drainage so they don't become water logged.
Soil structure	A 'well structured' soil has plenty of living spaces, storage spaces, doorways, and passages (for utilisation by water, gases, nutrients, roots and a vast array of organisms). A poorly structured soil is much less endowed, and much less productive. Only about 50% of soil is solid material. The remainder is pore space. It is in these spaces that the action happens. Water is stored there. Organisms live there. Organic matter and nutrients accumulate there.
Compaction	Compaction occurs when a force compresses the soil and pushes air and water out of it so that it becomes denser. Compaction is more severe when the soil is wet and less able to withstand compression. Compaction is a concern because it affects plant growth. There are not enough pores or spaces in compacted soil to allow unrestricted root movement, infiltration, drainage or air circulation. The restricted roots are often unable to take up sufficient water or nutrients from the soil. The result is less plant growth and lower yields, particularly during periods of drought.
Friability	Friable soil is soil that has the crumbly texture ideal for the root growth of plants. Such friable soil is usually a "loam."

Science and Technology: Stage 3

Title: What's the Weather?

This lesson and its outcomes integrate within the above unit or can be used as a stand-alone lesson.

Aim: Students identify pests that occur in their Munch & Crunch garden. Develop a pest control plan for their garden over the four seasons of the year.

Outcomes	Indicators
INVS3.7 Conducts their own investigations and makes judgments based on the results of observing, questioning, planning, predicting, testing, collecting, recording and analyzing data, and drawing conclusions.	• Identifies and compares natural and chemical pest control methods. • Scientifically analyses the best pest prevention and control methods for their garden produce.
LTS3.3 Identifies and describes and evaluates the interactions between living things and their effects on the environment.	• Identifies common Munch & Crunch garden pests and control methods

Resources:

- One Magic Square by Lolo Houbein
  Page 161 Pests and Predators
  Page 169 An A-Z of Pests and Problems

- Kitchen Garden Companion by Stephanie Alexander
  Page 731 Pest and Weed Control

- View Youtube: Natural Pest Control for your Garden - Select the following link:
  http://www.youtube.com/watch?v=nEI7NoxGpZo

- Worksheets – Chemical verse Natural pest control, Common Munch & Crunch Garden Pests, Pest Control Experiments.

Activities:

1. Revise the units of work in Stage 1 and Stage 2 for weed and pest control, companion planting and crop rotation.
2. View the Youtube clip, Natural Pest Control for your Garden. Define with the class what a ‘repellant’ is and ‘what to look for when identifying pest damage’.
3. Research the advantages and disadvantages of chemical verses natural controls. Complete worksheet.
4. Work in pairs and identify the common garden pests and ways of controlling them. Present your findings to the class and complete the worksheet.
5. List the plants you intend to grow and create a wall chart that shows what needs to be done to control the common pests.
6. Conduct a scientific test for any pest control methods used on the garden. Take before and after photos and monitor and record every day to see if the method is effective. Complete the science experiment worksheet.

Summary:

Begin your own garden pest diary. Take a photo of the pest and the damage it is causing to the plant. Record what the plant is and the month and the season that it presents. Then record how you attempt to control the pest and whether it is effective or not. Then this can be used for the future year’s gardens.

Student Name: _____

Chemical Verses Natural Pest Control Methods

Chemical Controls	Advantages	Disadvantages
Natural Controls		

Conclusion:

Discuss which method you believe should be used for your school Munch and Crunch garden.
Discuss:

_____

_____

_____

_____

_____

_____

_____

_____

Student Name: _____

Common Munch & Crunch Garden Pests

Pests	Plants They Effect	Control Methods
Aphids		
Birds		
Cabbage White Butterfly		
Codling Moth		
Curly Leaf		
Earwigs		
Fruit Fly		
Fungi		
Grasshoppers		
Nematodes		
Pear slug		
Powdery Mildew		
Possums		
Rabbits		
Rodents		
Snails and Slugs		
Strawberry Protection		
Weeds		
Whitefly		

Student Name: _____

Pest Control Experiments

Aim:

_____

_____

_____

Method:

_____

_____

_____

What do you expect might happen?

_____

_____

_____

Before Photo & Plant Type	Days Monitored	After Photo

Conclusion:

_____

_____

_____

Human Society and its Environment: Stage 3

Title: Identity and Values

Learning Sequence 2: Investigating Australian Identities, Past and Present

This lesson and its outcomes integrate with the above unit or can be taught as a stand-alone lesson.

Aim: Students identify and experience traditional Australian food using produce from the garden.

Ask students to consider some of the cultural images that people both inside and outside Australia would identify as being Australian. (Reference: BOS>K-6 Syllabus; HSIE Identity and Values Stage 3)

Outcomes	Indicators
Science and Technology DMS3.8 Develops and resolves a design task by planning, implementing, managing and evaluating the design process.	• Creates their own uniquely Australian food.

Resources:

- To identify traditional Australian Foods and recipes, select the following link: http://australia.gov.au/about-australia/australian-story/austn-food-and-drink
- Contemporary Australian cuisine and its growing regions. Select the following utube link titled Australian Flavour: http://www.youtube.com/watch?v=V-WkA5MSbNA&feature=related
- Traditional Australian Foods worksheet
- Recipe template

Activity:

1. Students identify traditional Australian foods and identify the reasons behind their creation.
2. Students research traditional and contemporary Bush Tucker and what makes a food typically Australian.
3. Students then devise an innovative healthy Australian food recipe using ingredients from their school garden. Write the recipe up using the template and prepare the recipe at home. This may take several times until they have something edible. Bring the food to school and have the class sample it. Students will present a justification on why their food could become a future traditional Australian food icon.

Summary:

- How does a food become an Aussie icon? What makes your innovative recipe healthy?

Teacher Resources

Traditional Australian Foods

Student Name: _____

Research foods that have become traditional Australian Foods and complete the following table.

Traditional Australian Food	Date of Origin	Explain why its become traditional or write an interesting fact
Vegemite	Invented in 1912 from brewers yeast.	Good source of Vitamin B

Student Name: _____

Recipe Name: _____

Serves: _____

Preparation Time: _____

Ingredients:

Equipment:

Method:

Justification:

My recipe is healthy because _____

_____

My recipe would become an Aussie icon because _____

_____