

Science – What's the Dirt?

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Number of lessons: Six

Year Level(s): Four

Australian Curriculum content descriptions:

Earth's surface changes over time as a result of natural processes and human activity (ACSSU075).

Science knowledge helps people to understand the effect of their actions (ACSHE062).

Science involves making predictions and describing patterns and relationships (ACSHE061).

With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge (ACSIS064).

Consider the elements of fair tests and use formal measurements and digital technologies as appropriate, to make and record observations accurately (ACSIS066)

Compare results with predictions, suggesting possible reasons for findings (ACSIS216).

Reflect on investigations, including whether a test was fair or not (ACSIS069).

Achievement standard:

- They discuss how natural processes and human activity cause changes to Earth's surface.
- Students follow instructions to identify investigable questions about familiar contexts and make predictions based on prior knowledge.

- They describe ways to conduct investigations and safely use equipment to make and record observations with accuracy.
- Students suggest explanations for observations and compare their findings with their predictions.
- They suggest reasons why a test was fair or not.

Lesson 1 – Let's Look Closely (60 mins)

Context

Students will think about the importance of soil, and look closely at soil samples.

Materials and equipment

- Large sheets of paper for See, Think, Wonder
- Markers
- YouTube Video 'Why Dirt Matters'
- 4 different types of soil samples from different areas in clear containers so students can see (most will be a mix of all 6 soil types - clay, sandy, silty, peaty, chalky, loamy)
- magnifying glasses
- gloves (optional)
- Investigating Soil Samples worksheet

Safety Advice

Students will need to discuss safety measures before making contact with the soil samples. Gloves will need to be worn, or hands washed with soap after investigating the soil.

Prior to Lesson

Soil samples will need to be collected and divided into clear containers and labelled Soil Sample A, B, C, D.

Set up at stations which also include magnifying glasses and gloves (optional).

Objectives

- Students will contribute prior knowledge about soil and the importance of it to our ecosystem.
- Students will identify that dirt is an important part of our ecosystem.
- Students will understand that there is more than one type of dirt.

Introduction (20 mins)

- Students are put into mixed ability science groups for the unit. Note: Groups no larger than 6 is ideal.
- Students are each given the worksheet Investigating Soil Samples to investigate the soil samples.
- Discuss as a class the safety measures that will need to be taken when closely investigating the soil samples. I.e., not putting in mouth, washing hands after touching, not rubbing eyes etc.
- Students work in their groups to investigate each soil sample, adding a description of what they are noticing about the soils.

Core (30 mins)

- Students are presented with the statement 'Dirt is all the same and is not important'
- In their student groups they discuss the statement and decide whether they disagree or agree and why, writing their answer on chart paper or a small whiteboard.
- Groups share their responses with the class by either doing a 5-minute silent walk and read OR one group member shares to the class group.
- Students watch the video about the importance of dirt and the different types of dirt in our environment.

Conclusion (10 mins)

Students answer the three reflection questions in their science book: Do you think dirt is important, why? What different types of dirt are there? What do you think would happen if we didn't have different dirt types?

Resources

Student vocabulary words:

clay, silt, sand, chalky, dry, moist

Worksheet:

Investigating Soil Samples

Useful links:

<https://www.qld.gov.au/environment/land/management/soil/soil-properties/colour>

<https://www.healthysoils.com.au/Soil-Health.php>

Lesson 2 – How Healthy is Our Soil?

Colour Investigation (60–90 mins)

Context

Students will learn how soil can be different by learning and using testing methods used by soil scientists in the field.

Materials and equipment

- YouTube Video Soil Testing Methods <https://youtu.be/S14F3SJRK7M>
- Data Collection Worksheet
- Soil core sample tubes
- 6 Plastic test tubes or other small containers (enough for the groups or whole class)
- 6 glass or plastic jars that are the same size (250ml)
- 2 buckets for separating the top soil and subsoil
- Soil colour Investigation Planner

Safety Advice

Class will need to discuss safety measures about investigating soil. I.e. – using gloves or washing hands, not putting their face too close to the soil and inhaling it.

Objectives

- Students will learn how soil cores are taken to conduct soil sampling.
- Students will conduct their own data collection on the soil around their school.
- Students will investigate which area in their school has the healthiest soil and use scientific understanding to reason why.

Prior to the Lesson

- Teachers will need to find several different sites around the school with different soil quality to test as a class. It is important that the soils differ to allow students to see the differences in the types of soil.
- Teachers will need to ensure all soil testing equipment is organized and ready.

Introduction

- Look at the infographic which displays healthy soil and discuss why each of the different elements might be important.
- Explain to students that they will be conducting a data collection to investigate the soil around their school and its health by looking at the soil color.

Core

- Share with students the video of soil scientists collecting samples.
- Discuss what is necessary for a fair test (one variable, one measure, everything else kept the same). Discuss with students the following questions: How did the soil scientist ensure their collection was fair? What would happen if the soil scientist didn't dig the same amount each time? What would happen if the soil scientist only collected a tiny sample of soil?
- Read with students the method for data collection and the importance of the collection is fair.
- Fill in the fair testing and safety parts of the investigation planner.
- Decide as a class the four areas of investigation and write them into the planner.
- Demonstrate to the students how to draw an annotated diagram before heading outside if necessary.
- As a class, walk around the school and complete soil samples, filling in the table and drawing an annotated diagram for each one (if students are not aware of annotated diagrams, draw an example in the classroom prior to conducting investigation).

Conclusion

- Reflect and discuss as a class if the investigation was fair or not. Students fill out this part of the investigation planner after a class discussion has occurred

Resources

Student vocabulary words:

annotate, variable, hypothesis, topsoil, subsoil, sample

Digital:

<https://youtu.be/S14F3SJRK7M>

Worksheet:

Soil Colour Investigation Planner

Useful links:

<https://www.qld.gov.au/environment/land/management/soil/soil-properties/colour>

<https://www.healthysoils.com.au/Soil-Health.php>

Lesson 3 – How Healthy is Our Soil?

Texture Investigation (60 mins)

Context

Students will test the texture of their soil samples to help determine the health, using soil scientist methods.

Materials and equipment

- soil samples from their chosen sites
- gloves or access to hand washing
- water
- an open space

Safety Advice

Class will need to discuss safety measures about investigating soil. I.e. – using gloves or washing hands, not putting their face too close to the soil and inhaling it.

Objectives

Students will conduct a texture investigation on their soil sites to determine the health of the soil sites.

Introduction

- Students play a game of 'Whiteboard Relay' to revise what they know about the importance of soil.
- Students are put into teams of around 4 and given a whiteboard and marker OR a piece of chart paper. The resources are on one side of the room, and the students on the other.
- The students take turn in a relay to add what they know to support the statement.

Core

- Students receive the investigation planner and read the investigation question and method.
- As a class, define the word 'texture' and how it could relate to soil

- Students decide on their own hypothesis relating to the texture of the soil and determine how the test will be fair.
- Students return to their science groups and conduct the texture investigation as per the investigation planner.

Conclusion

Return as a group and display the vocabulary words to help them

Resources

Student vocabulary words:

texture, organic matter, nutrients, variable, hypothesis

Worksheet:

Soil Colour Investigation Planner

Useful links:

<https://www.qld.gov.au/environment/land/management/soil/soil-properties/colour>

<https://www.healthysoils.com.au/Soil-Health.php>

Lesson 4 – How Healthy is Our Soil? Taking Another Close Look (60 – 90 mins)

Context

Students will take a final look at the soil samples and identifying the possible reasons for the soil qualities.

Materials and equipment

- Take Another Close Look worksheet
- Glass jars with soil from previous lessons filled with soil samples

Safety Advice

Class will need to discuss safety measures about investigating soil. i.e. – using gloves or washing hands, not putting their face too close to the soil and inhaling it.

Objectives

The purpose of this lesson is to identify the different layers in the soil, its health and what impact it could have on the rest of the environment.

Prior to the Lesson

The soil is required to be stored in jars and filled with water prior to the lesson. Make sure that you leave the jars untouched for at least 24 hours for the layers to settle before completing this lesson.

Introduction

- Bring student's attention to the three glass jars from the previous lesson (make sure not to move them as the dirt would have separated and settled).
- Discuss what they are noticing (separated soil, light parts floating, bark, insects and other debris is visible.)

Core

- Ask students to recall what is necessary for soil to be healthy. Refer to infographic from previous lesson if necessary.
- Determine if they think the soil is healthy and reason why in a class discussion.
- Return to their predictions and students' pair, share if their prediction was correct, why or why not.
- Discuss vocabulary that could be used in their annotated diagrams and write a list (soil, layers, debris, compost, plant matter etc.)
- Students draw and annotate their diagrams of the three soil samples.
- Watch the video '[Stop soil erosion, keep dirt where it belongs!](#)'
- Introduce students to the phrase 'Weathering breaks it, Erosion takes it' for students to remember the difference between the two words.

Conclusion

- Students go and visit their three soil sites and discuss the human, animal and environmental impacts that are occurring in each area that might cause weathering and erosion and changes to the soil quality.

Resources

Student vocabulary words:

erosion, weathering, annotated, organic matter, clay, loam, sand

Digital:

<https://youtu.be/MSbbl5lpmik>

Worksheet:

Taking Another Close Look Planner

Useful links:

<https://www.qld.gov.au/environment/land/management/soil/soil-properties/colour>

<https://www.healthypoils.com.au/Soil-Health.php>

Lesson 5 and 6 – The Final Test: Will It Grow? (60 – 90 mins)

*Some of this lesson will need to be completed daily across one week.

Context

Students will complete a final investigation to explore how the soil quality impacts plant's ability to grow.

Materials and equipment

- Small pots or cups (3 for each group)
- Fast growing seed (lima beans, kidney beans, pinto beans, black beans)
- Soil samples from all three test sites
- A hot, sunny place for the plants to sit
- Gloves
- Small watering cans (alternatively, recycled water bottles with pinholes in the caps will work too)

Safety Advice

Class will need to discuss safety measures about investigating soil. I.e. – using gloves or washing hands, not putting their face too close to the soil and inhaling it.

Objectives

Students will consolidate the relationship between soil health and the ability for plants to thrive.

Introduction

- Students are asked to identify the essential things for plants to grow (light, air, water, nutrients).
- Ask students to determine what plants need to thrive and discuss.

Core

- Students read the investigation planner and fill in the front page.
- In their science groups, students plant their seeds using the soil, label them with date and soil sample site and annotate their first diagram.
- Find a warm, and consistently sunny spot for the pots to be kept for the week.
- Each day, students will need to water (same amount) and annotate their diagram.

Conclusion

- Students complete the final reflection in their investigation planner.
- Optional extension project: Determine how one of the sites could be rejuvenated or protected as a class. Undertake this and plant some plants to determine whether the protection/rejuvenation was successful or not.

Resources

Student vocabulary words:

thrive, sprout, annotation, hypothesis

Worksheet:

The Final Test, Will it Grow? Planner

Useful links:

<https://www.qld.gov.au/environment/land/management/soil/soil-properties/colour>

<https://www.healthysoils.com.au/Soil-Health.php>

Looking Closely at Soil Worksheet

Investigating Soil

Instructions: Investigate the soil and write down your research below.

Soil Sample Look Like Feel Like Sound Like Location

Write the soil Use the magnifying Rub it in between your Gently move the Where do you predict sample letter glass to look closely. fingers. What is the container around. What this dirt comes from, below texture? does it sound like? and why?

Soil Colour Investigation Planner

How Healthy is Our Soil?

Soil Colour Investigation Planner

Investigation Question: *(What are we trying to figure out?)*

Which soil site has the healthiest soil?

Hypothesis: *(What do you think will happen? Why?)*

I think that _____

This is because _____

Variables:

Change: _____

Measure: _____

Same: _____

Equipment:

- Soil Core sampler (soft-drink bottle)
- 6 plastic Tubes or small containers
- Gloves
- 6 glass jars or containers
- Bucket to mix samples
- Shovel to loosen soil if needed

Method:

Step 1: Decide on three places around your school to test the healthiness of the soil, labelling them sites A, B and C.

Step 2: Use your core sampler to extract soil from the ground. *Make sure to fill in the hole afterward.*

Step 3: Separate the topsoil and subsoil into the two buckets by emptying the tube on either end.

Step 4: Place a sample of the topsoil and subsoil into the test tubes and label them with the site letter.

Step 5: Pour the remainder of the soil into one of the jars and label with the site.

Step 6: Repeat the steps for each of the soil sites.

Soil Colour Investigation Planner

Safety Procedures: *(How will everyone be kept safe?)*

Annotated Diagrams:

Site A
Site B
Site C

Soil Colour Investigation Planner

Results:

Use the table below to determine the health of each of the soil samples.

Soil Colour	Properties	Plant suitability	Soil Samples
Black/dark	Slow to drain High levels of organic matter Holds onto nutrients Medium water holding	suitable	
White/pale	Well drained Low levels of organic matter Doesn't hold onto nutrients Doesn't hold onto water Low plant available water	Not suitable	
Red	Well drained Medium – high levels of organic matter Low water holding Medium hold onto nutrients	suitable	
Yellow	Low drainage Medium – high levels of organic matter Medium holding onto nutrients Low to medium water holding	Not suitable	
Brown	Well drained Medium to high levels of organic matter Medium holding to nutrients Low water holding	suitable	
Grey/blue grey/green	Poorly drained Low levels of organic matter Low holding to nutrients High water holding	Not suitable	

Information sourced from: www.soilscienceaustralia.org.au

Did the results match your prediction? Why/why not?

Was this test fair? How could fairness be improved?

Soil Texture Investigation Planner

How Healthy is Our Soil?
Soil Texture Investigation Planner

Investigation Question: *(What are we trying to figure out?)*

Hypothesis: *(What do you think will happen? Why?)*

I think that _____

This is because _____

Variables:

Change: _____

Measure: _____

Same: _____

Equipment:

- Soil Samples from previous lesson
- Gloves
- Water
- An outside area

Method:

- Step 1: Using the soil samples from the test tubes, and place a small amount in your hand.
- Step 2: Add water slowly, until you are able to form a ball that sticks together.
- Step 3: Keep kneading the ball in your hands for another minute to test how well the soil sticks together.

Safety Procedures: *(How will everyone be kept safe?)*

Soil Texture Investigation Planner

Results:

Use the table below to determine the results of the texture test.

Soil Sample match	Soil Behaviour	Soil Type	Suitability for Planting
	Feel: very sandy, not sticky Ball: fragile, falls apart	Sands	Not ideal for planting
	Feel: sandy, no stickiness Ball: fragile, just holds together	Loamy sands	Not ideal for planting
	Feel: sandy, slight stickiness Ball: can be handled	Sandy loams	ideal for planting
	Feel: slightly sandy, a bit spongy, and 'greasy' Ball: smooth or spongy, holds together	Loams	Most ideal for planting
	Feel: sandy Ball: holds together strongly	Sandy clay loams	ideal for planting
	Feel: almost no sand, distinctively sticky Ball: smooth, plastic, holds together strongly	Clay loams	ideal for planting
	Feel: no sand, very sticky Ball: smooth, plastic, holds together strongly	Light Clay	Not ideal for planting
	Feel: no sand, extremely sticky Ball: smooth, plastic, like plasticine	Medium to heavy clay	Not ideal for planting

Did the results match your prediction? Why/why not?

Was this test fair? How could fairness be improved?

Taking Another Close Look Planner

**How Healthy is Our Soil?
Soil Contents Investigation**

Use the boxes below to draw annotated diagrams of the jar contents.

Site A
Site B
Site C

The Final Test, Will it Grow Planner

The Final Test
Will they Grow?

Investigation Question: (What are we trying to figure out?)

Hypothesis: (What do you think will happen? Why?)

I think that -----

This is because -----

Variables:

Change: -----

Measure: -----

Same: -----

Equipment:

● Plastic cups or pots

● Samples from site A, B, C

● Fast growing seeds (lima beans, kidney beans, pinto beans, black beans)

Method:

Step 1: In your science groups, plant your seeds into three different pots, using the soil samples from sites A, B and C.

Step 2: Make sure to keep all variables the same except the soil type.

Step 3: Label the pots and water the plants thoroughly.

Step 4: Place the pots in a sunny area and water them daily for a week.

Step 5: Draw a detailed annotated diagram after each day, or take a photo and annotate it digitally to track their progress.

Step 6: After about 10 days, end the investigation and record your results.

Safety Procedures: (How will everyone be kept safe?)



The Final Test, Will it Grow Planner

Annotated Diagrams: _____

	Pot A	Pot B	Pot C
1			
2			
3			
4			
5			
6			

The Final Test, Will it Grow Planner

Results and Discussion:

Did the results match your prediction? Why/why not?

Was this test fair? How could fairness be improved?

Based on the information gained from the last four investigations, circle the soil site that you think has the healthiest soil.

Site A Site B Site C

Why did you choose that site?

The Final Test, Will it Grow Planner

What things do you think have impacted the health of the soil in the three areas?
(think human, animal, and environmental impacts)

Site A:

Site B:

Site C:

Do you think any of the sites could be improved? How?
