**ACTIVITY: Dig a hole**

**Activity idea**

In this activity, students use a picture book and/or dig a hole to learn more about soil, observation and inference in science.

By the end of this activity, students should be able to:

* make observations about what they see in the picture book
* make inferences about what they think is happening in the picture book
* use their senses of sight and touch to make observations about soil from the playground
* make inferences about the soil based on their observations.

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**Introduction/background**

The New Zealand Curriculum promotes the development of citizenship capabilities – for students to be ready, willing and able to use their science knowledge. One of these capabilities is to gather and interpret data. Science Online (<http://scienceonline.tki.org.nz>) describes this capability:

Science knowledge is based on data derived from direct, or indirect, observations of the natural physical world and often includes measuring something. An inference is a conclusion you draw from observations – the meaning you make from observations. Understanding the difference is an important step toward being scientifically literate.

This activity offers students the opportunity to find something spectacular – and to practise making observations and inferences – both indoors with a picture book and outdoors with real soil.

In the picture book *Sam & Dave Dig a Hole* by Mac Barnett (Walker Books, 2014), Dave says, “We won’t stop digging until we find something spectacular.”

If the picture book is not available, you can use the image [Similar but different](http://link.sciencelearn.org.nz/images/995-similar-but-different).

Although a spade works well in part 1 of this activity, check out [Making a core sample](http://link.sciencelearn.org.nz/resources/675-making-a-core-sample) for directions on making a soil corer. The corer is a similar tool to those used by soil scientists.

**What you need**

* A copy of *Sam & Dave Dig a Hole* by Mac Barnett (Walker Books, 2014)
* Whiteboard or similar to record ideas
* Spade, soil corer (optional) or some means of digging in the soil
* Ground sheet or sheets of newsprint
* Sports cone
* Hand lenses
* Digital microscope (optional)
* Tablets or other recording devices (optional)

**What to do**

***Part 1***

1. Read the book *Sam & Dave Dig a Hole* by Mac Barnett (Walker Books, 2014).
2. Discuss the story with students. Ask them to describe what they saw on the pages and what happens during the story. (Note: the story is open ended.)
3. Discuss observation and its role in science. (Science knowledge is based on data derived from direct, or indirect, observations of the natural physical world and often includes measuring something.)
4. Discuss inference and its role in science. (An inference is a conclusion you draw from observations – the meaning you make from observations.)
5. Read the book once more, asking the students to think like scientists.
6. Record student observations under the heading ‘I see…’. Remind students they can only discuss what they can see or observe in the pages of the book. (Careful observers will notice how the boys and their environment change as the story progresses.)
7. Ask the students to make inferences about the events in the story and its ending. Record these ideas under the heading ‘I think…’. Students must justify their inferences based on actual observations.
8. Note if or how student observations changed between the first and second reading.

Alternative option: If the picture book is not available, show students the image [Similar but different](http://link.sciencelearn.org.nz/images/995-similar-but-different). Students make observations about the colour of the soil. They can infer that the soils are different due to location, drainage and what makes up the soil.

***Part 2***

1. Choose a time when the soil is moist. If it is too dry, it can be difficult to dig a hole. If it is too wet, the soil can be muddy and difficult to handle.
2. Find a suitable place to dig a hole. Avoid high-use areas where the soil is likely to be compacted and difficult to dig. Avoid areas where roots may cause difficulties. It also pays to check where services like power or water are placed in the property.
3. Use the spade or corer to dig a hole. Dig out a spade width of turf and lay it on a ground sheet or layers of newsprint.
4. Dig down to get another spadeful of soil and place it below the turf roots. This is the beginning of a soil profile. A profile shows what the soil looks like from the surface downwards.
5. Notice if the soil changes as you dig deeper. Ask students to use their eyes and their hands to observe. Does the soil have the same colour? Does it feel the same if they rub some between their fingers?
6. Continue to dig until it gets too difficult. Mark the site with a sports cone to alert others to the hole.
7. Carefully carry the soil profile inside. If it is too heavy, take handfuls of soil and make a narrower profile.
8. Use hand lenses or digital microscopes to examine the soil. Look through the turf and roots for soil animals like earthworms or insects. Break clods apart to observe what is inside or to see if the soil colours change. Measure the length/depth of plant roots.
9. Are there any inferences students can make based on their observations? (Earthworms may indicate a healthy soil. Mottled soil may mean the soil is poorly drained.)
10. Use tablets or similar to take photos and record student observations.
11. Return the soil to the hole.

**Extension ideas**

Dig a hole in another part of the school – at the top or bottom of a hill if one is available. Compare the soil from the different locations.

Check out the student activity [Visual soil assessment](http://link.sciencelearn.org.nz/resources/981-visual-soil-assessment). The activity involves digging up a 20cm cube of soil to examine the soil structure and porosity and look for earthworms.