**ACTIVITY: Observation in science – three-level reading guide**

**Activity idea**

In this activity, students use a three-level reading guide to locate information about the role of observation in science from the text of an article. They interpret what the text means and then apply the information to consider ways scientists use observation to gather evidence.

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

* locate information in the text
* interpret what the text means
* apply the information.

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**[Introduction](#Introduction)**

In this activity, students use a three-level reading guide strategy to locate, interpret and apply the information to consider the role of observation in research in finding more about the role of earthworms in primary production.

The article [The role of observation in science](http://link.sciencelearn.org.nz/resources/8-the-role-of-observation-in-science) highlights how New Zealand research on earthworms helps ensure primary production practices continue to focus on high productivity with reduced on-farm input costs.

A three-level reading guide supports students to locate information in a text, interpret what the text means and then apply the information.

* Using a three-level reading guide leads students to first focus on the actual information in the text (level 1).
* Next, they think through the information, making links between ideas and interpreting the intent of the text (level 2).
* Finally, they consider the implications of the ideas, making generalisations and critically evaluating the arguments (level 3).

The best approach to the three-level reading guide strategy is for students to consider each of the three levels individually and then to discuss their responses with a partner so that they can confer and check their own ideas closely with the text.

A three-level reading guide should be used as an activity to generate discussion among your students. It provides a structured strategy for students to give their views and justify what they say by referring back to the text. For this reason, this strategy is not appropriate for use as a homework exercise or test.

**What you need**

* Copies of the student handout [Reading about observation in science](#handout)
* Access to the article [The role of observation in science](http://link.sciencelearn.org.nz/admin/articles/8-the-role-of-observation-in-science)

**What to do**

1. Hand out copies of the student handout [Reading about observation in science](#handout).
2. Give students the opportunity to answer the questions and discuss these with a partner.
3. Have students consider a way they might investigate the frequency of earthworms by exploring one of the questions suggested in the article on a nearby farm or grass area and to plan a method they could use to gather evidence.

**Student handout: Reading about observation in science**

Read the article [The role of observation in science](http://link.sciencelearn.org.nz/resources/8-the-role-of-observation-in-science) and answer the following questions.

***Reading on the lines***

When reading ‘on’ the lines, you use/select factual statements from the text.

1. List the three main ideas covered in the article.
2. Name two tools scientists use to help them extend their own vision or hearing as they observe.
3. What did Charles Darwin find out about by observing earthworms?
4. What is the most reliable method to use to observe earthworms in the field?
* Counting earthworm burrows
* CAT scans
* Photos
* Hand sorting

***Reading between the lines***

When reading ‘between’ the lines, you use ideas that are suggested by the text.

1. How do scientists use observation as part of scientific investigations?
2. Why did Dr Trish Fraser use CAT scans to find out more about earthworm burrows?

***Reading beyond the lines***

When reading ‘beyond’ the lines, you link ideas that are either suggested in the text and/or from your own understanding of the topic.

1. Why is observing and knowing more about earthworms important for our future?

**Reading about observation in science – answers**

1. List the three main ideas covered in the article.
* *The role of observation in science.*
* *Observing earthworms.*
* *Observation techniques.*
1. Name two tools scientists use to help them extend their own vision or hearing as they observe.

*Microscopes, scanners or transmitters.*

1. What did Charles Darwin find out about by observing earthworms?

*Their sensitivity to light and* [*heat*](http://sciencelearn.org.nz/About-this-site/Glossary/Heat-energy-heat)*, their food preferences and to test their intelligence.*

1. What is the most reliable method to use to observe earthworms in the field?

*Hand sorting.*

1. How do scientists use observation as part of scientific investigations?

*They use observations that are as precise and accurate as possible to help them construct and test their theories and hypotheses. To make this happen, they use equipment that will measure and weigh accurately, often recording information that cannot be accessed in the classroom such as radiation levels.*

1. Why did Dr Trish Fraser use CAT scans to find out more about earthworm burrows?

*Hand counting destroys the soil. She wanted to be able to observe the earthworms’ burrows and how they change over time, so she needed a technique that meant the burrows were not destroyed. She can do this with the CAT scanner.*

1. Why is observing and knowing more about earthworms important for our future?

*Research into earthworm activity is important because we know earthworm burrows increase water infiltration and soil aeration and that they have a major impact on* [*nutrient*](http://sciencelearn.org.nz/About-this-site/Glossary/nutrient) *cycling. However, we still do not know the things that could help improve farm productivity in the way the Raetihi farmer wants to know. Investigating these questions could help improve farm production and give better crop production:*

* *Which* [*species*](http://sciencelearn.org.nz/About-this-site/Glossary/species) *are present and where?*
* *How much do they eat?*
* *How are they affected by farm management practices?*