



Thinking in Scientific Ways

Developing and Communicating Scientific Understanding

ACCESS THE SCIENCE EXEMPLARS ONLINE AT www.tki.org.nz/r/assessment/exemplars/sci/

LEVEL 1 2 3 4 5

How Do We See? 1

THE LEARNING CONTEXT

The teacher's intended outcomes were for the students to:

- explain how we see, using scientific ideas
- contribute to a discussion aimed at explaining their observations.

The intended outcomes were aligned to the following "big ideas":

- We are able to see an object because light is reflected off the object's surfaces and is received by the eye.
- Scientists think of ideas that they share and discuss with others.

The teacher introduced the class to light and colour as part of a "light festival". The class activities included making rainbows, observing bubbles, making colour wheels, trying to see things in a darkened room, bouncing light from torches off reflective surfaces, and using mirrors to reflect light. At the end of the unit the teacher asked the students to complete the "What we need to see" activity with a view to planning further learning.

How Do We See? 2 (level 2) and How Do We See? 3 (level 3) are other exemplars that show students studying the effects of light.

Teacher-student conversations

At the beginning of the unit:

- Teacher: What can you tell me about the rainbow reflection on the wall?
- Dylan: The sunlight changes into colours. I have seen these colours on the road when it is wet.

At the end of the unit:

- Teacher: Dylan tell us what you found about the rainbow reflection.
- Dylan: The sun makes the light. The light goes through the window and goes through the prism then on to the paper. The light is rainbow colours on the paper.

WHERE TO NEXT?

To move Dylan towards the next learning step the teacher could help him focus on:

- understanding that light travels from the Sun (source) to the tree and the light reflects off the tree and travels to his eyes (developing and communicating scientific understanding).
- participating in discussions where he can use his experiences as evidence to support his ideas (thinking in scientific ways).

The teacher could:

- provide experiences where he can see light travelling, see *Making Better Sense of the Physical World* pages 42–43, *Shadows*, Book 9 (developing and communicating scientific understanding)
- encourage class discussions, based on evidence gained from experience, in further scientific studies (thinking in scientific ways).

CURRICULUM LINKS

Science in the New Zealand Curriculum

Achievement Objectives

Level 1: Making Sense of the Physical World

Students can share and clarify their ideas about easily observable physical phenomena.

Science in the New Zealand Curriculum, page 72
http://www.tki.org.nz/r/science/curriculum/p72_73_e.php

Levels 1 and 2: Developing Scientific Skills and Attitudes

Information gathering: Students can talk about their observations and measurements.

Science in the New Zealand Curriculum, page 45
http://www.tki.org.nz/r/science/curriculum/p44_51_e.php

Level 1: Making Sense of the Nature of Science and its Relationship to Technology

Students can share and compare their emerging science ideas.

Science in the New Zealand Curriculum, page 26
http://www.tki.org.nz/r/science/curriculum/p26_27_e.php

Te Whāriki

Strand 5: Exploration

Goal 1

Children experience an environment where their play is valued as meaningful learning and the importance of spontaneous play is recognised.

Te Whāriki: He Whāriki Mātauranga mō ngā Mokopuna o Aotearoa/Early Childhood Curriculum, page 84

Goal 3

Children experience an environment where they learn strategies for active exploration, thinking and reasoning.

Te Whāriki: He Whāriki Mātauranga mō ngā Mokopuna o Aotearoa/Early Childhood Curriculum, page 88

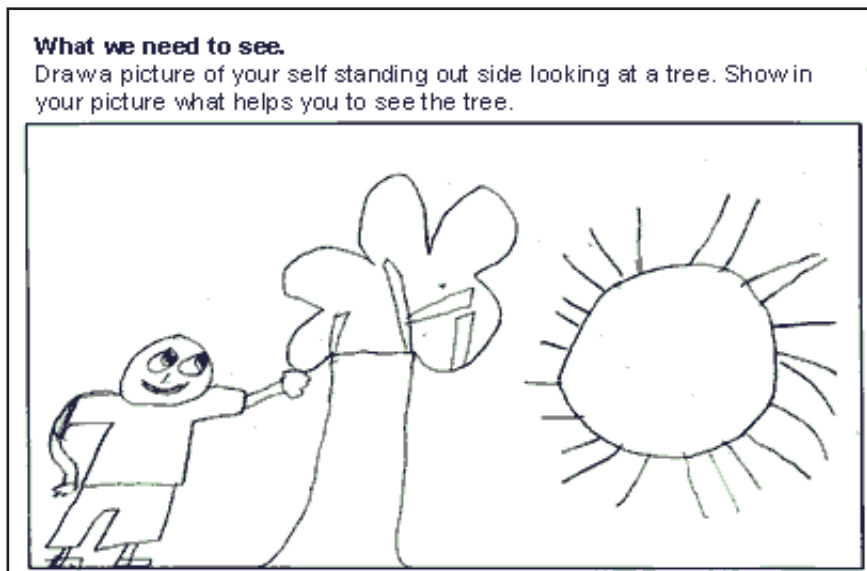


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How Do We See? 1

WHAT THE WORK SHOWS

Josh's written report and picture show how he created a bottle organ and played a tune on it. His work shows how he explored a scientific experience, made a significant contribution to a class discussion, and reported his findings.



Dylan's drawing of how we see

Dylan's explanation

"The light from the Sun goes onto the ground and shines on all the things and the tree and I can see it with my eyes."

Progress Indicator Thinking in Scientific Ways

Suggesting explanations

Dylan's literal drawing of his eyes pointing towards the tree and the statement "I can see it with my eyes" suggests that Dylan is *offering a simple explanation for observations or events*. He believes that his eyes link up with the tree to create an image rather than the light reflecting off the tree into his eyes.

REFERENCES

Ministry of Education (1993). *Science in the New Zealand Curriculum*. Wellington: Learning Media.

Ministry of Education (1996). *Te Whāriki: He Whāriki Mātauranga mō ngā Mokopuna o Aotearoa/Early Childhood Curriculum*. Wellington: Learning Media.

Ministry of Education (1999). *Making Better Sense of the Physical World: Levels 1 to 4*, Wellington: Learning Media.

Ministry of Education (2001). *Shadows: Effects of the Absence of Light*. Building Science Concepts, Book 9. Wellington: Learning Media.

Progress Indicator Developing and Communicating Scientific Understanding

Using scientific ideas in constructing explanations

Dylan is *sharing his ideas about scientific experiences* both in his written report and also in his statement (see Teacher-student conversation) about the rainbow reflection.

Using scientific vocabulary

Dylan's vocabulary and his explanation suggest he is *exploring and using new vocabulary and uses it to label observable features*.



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Sounds of a Bottle Organ