



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

Chasing Shadows

THE LEARNING CONTEXT

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

- explain and demonstrate their knowledge and understanding of how shadows are formed
- explain, how and why, the size and shape of shadows change during the day
- begin to offer explanations for their observations after looking for changes and patterns.

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

- Scientists make and record observations systematically and seek patterns in their data.
- Shadows result when light is unable to pass through a substance.
- We see shadows on a sunny day or by using a light source.
- The shape of the shadow is determined by the shape of the object.
- An object is always between the light source and the surface on which the shadow forms.
- A shadow is an absence of light.
- A shadow joins the object where it touches the ground.

To establish the students' prior knowledge the teacher asked them for their ideas on what a shadow is. They drew pictures of themselves and their shadows without any assistance. They discussed their ideas, developed an "ideas bank" about shadows and generated questions about things they would like to investigate.

In subsequent sessions, the teacher chose activities from *Shadows*, Building Science Concepts Book 9 to develop the students' knowledge and help them find the answers to their questions about shadows. As the unit progressed students were given assessment tasks so that the teacher could plan the next teaching and learning step.

Jack's Shadow (level 2) is another exemplar that shows students observing the Sun creating shadows.

Teacher-student conversation

Teacher: Can you tell me what makes your shadow?
 Shantelle: The Sun makes it.
 Teacher: How did you decide what shape to make your shadow?
 Shantelle: Me. It shines on me and makes my shadow on the ground.

WHERE TO NEXT?

To move Shantelle towards the next learning step the teacher could help her focus on:

- suggesting possible explanations for her observations and comparing her explanations or observations with others (thinking in scientific ways)
- experimenting with, and using scientific vocabulary and sharing her ideas with others (developing and communicating scientific understanding).

The teacher could:

- provide opportunities to develop explanations by drawing attention to the shapes of shadows made by different objects and people (thinking in scientific ways)
- get the class to explore the concept of day and night (developing and communicating scientific understanding).

CURRICULUM LINKS

Science in the New Zealand Curriculum

Achievement Objectives

Level 1: Making Sense of Planet Earth and Beyond

Students can share their ideas about some easily observable features and patterns that occur in their physical environment and how some of these features may be protected.

Science in the New Zealand Curriculum, page 108
http://www.tki.org.nz/r/science/curriculum/p108_109_e.php

Levels 1 and 2: Developing Scientific Skills and Attitudes

Information gathering: Students can make observations and simple measurements.

Processing and interpreting: Students can identify trends and relationships in recorded observations and measurements by suggesting links between these.

Science in the New Zealand Curriculum, page 45-46
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 4

Children experience an environment where they develop working theories for making sense of the natural, social, physical and material worlds.

Te Whāriki: He Whāriki Mātauranga mō ngā Mokopuna o Aotearoa/Early Childhood Curriculum, page 90

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

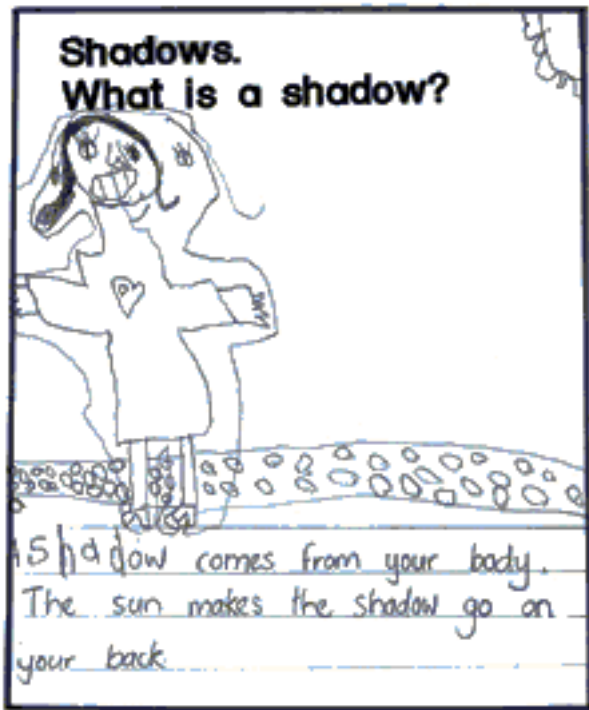


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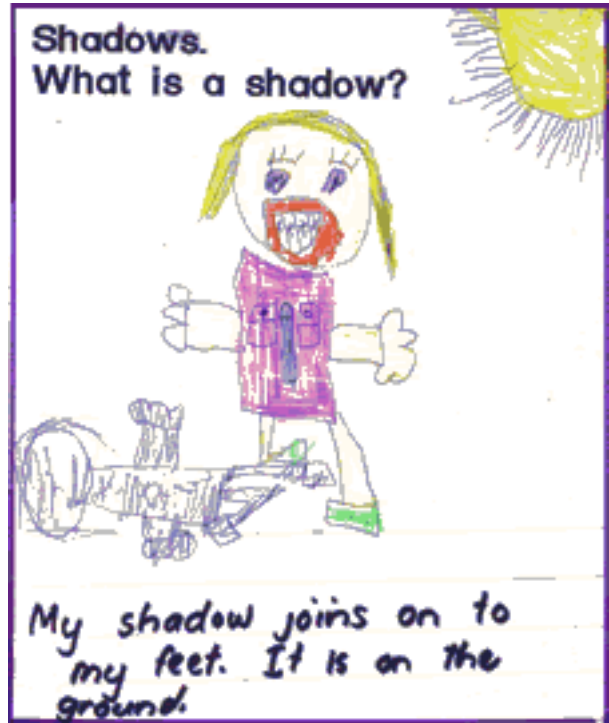
Chasing Shadows

WHAT THE WORK SHOWS

Shantelle's "before" and "after" view show that she has moved from giving simple, although inaccurate, observations of an event to offering an explanation for the event. She is beginning to understand the link between cause and effect.



Shantelle's "before" view



Shantelle's "after" view



Collage of class work



LEVEL | 1 | 2 | 3 | 4 | 5

Chasing Shadows

Progress Indicator

Thinking in Scientific Ways

Suggesting explanations

Shantelle offers a simple explanation that the Sun creates a shadow but she is unable to explain why. She does not relate the position of the Sun to the position of the shadow. She links the shadow to her own shape, but appears to confuse the concept of "being in the shade" with the concept of her shadow (see Shantelle's "before" view).

Progress Indicator

Developing and Communicating Scientific Understanding

Using scientific ideas in constructing explanations

She has a clear understanding of what is meant by a shadow, and shares her ideas about scientific experiences by describing her shadow in relation to the Sun's position (see Shantelle's "after" view).

Using scientific vocabulary

Shantelle uses new vocabulary to label observable features.

Reflecting on their own understanding

She accurately observes the position of the Sun in relation to her shadow. Her ideas about the shape of the shadow and where it is "attached" to the body show she is aware of changes in her own understanding.

- "My shadow is little when the Sun is up in the sky."
- "My shadow is big when the Sun is down in the sky."