



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? 2

THE LEARNING CONTEXT

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

- develop their ability to construct new understandings in discussion with others
- explain how we see using scientific ideas.

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

- Scientists think of theories to explain things, which they share and discuss with others.
- We see when light is reflected off objects and enters the eye.

To begin this study the teacher asked the class to record their understanding of "how we see" on the diagram of the students looking at a tree (see Samuel's "before" view). Then the class completed a variety of activities to develop their understanding of light.

They:

- experienced light activities in a blacked-out room (see *Light and Colour*, Building Science Concepts, Book 10)
- conducted trials to find better reflectors among a range of everyday materials and investigated how easy it was to see various colours in a darkened "peep-box" (see *Light and Colour*, page 14)
- developed signs that could be seen in low-light conditions (see level 2 exemplar, Signs for a Dark Night)
- "bounced" light around the classroom with mirrors (see *Light and Colour*, page 17).

After a class discussion on "how we see" the students recorded their own views. The drawings gave the teacher information on the students' ideas and what to plan and teach next.

WHERE TO NEXT?

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

- explaining how he decided which view is the best (thinking in scientific ways)
- gaining experience of a range of light sources (see *Light and Colour*, pages 12 and 13), discussing sources and reflectors and, suggesting Samuel include a source of light in his diagram (developing and communicating scientific understanding).

The teacher could:

- sort the class into groups of students with different ideas and ask them to justify and explain their views. The ideas could be recorded and discussion and further investigation encouraged (thinking like a scientist)
- encourage the students to study how the eye responds to bright light and darkness (developing and communicating scientific understanding).

CURRICULUM LINKS

Science in the New Zealand Curriculum

Achievement Objectives

Level 2: Making Sense of the Physical World

Students can investigate and describe their ideas about some everyday ideas of physical phenomena.

Science in the New Zealand Curriculum, page 74

http://www.tki.org.nz/r/science/curriculum/p74_75_e.php

Levels 1 and 2: Developing Scientific Skills and Attitudes

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 46

http://www.tki.org.nz/r/science/curriculum/p44_51_e.php

Level 2: Making Sense of the Nature of Science and Its Relationship to Technology

Students can use a variety of methods to investigate different ideas about the same object or event.

Science in the New Zealand Curriculum, page 28

http://www.tki.org.nz/r/science/curriculum/p28_29_e.php

REFERENCES

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

Ministry of Education (2001). *Light and Colour: Our Vision of the World*. Building Science Concepts, Book 10. Wellington: Learning Media.

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

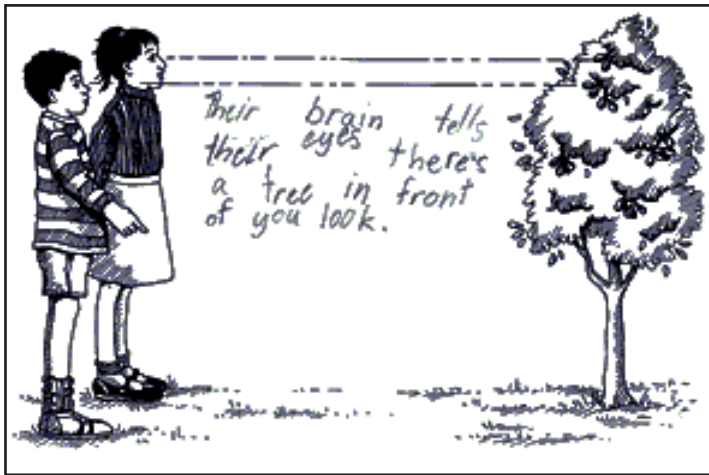


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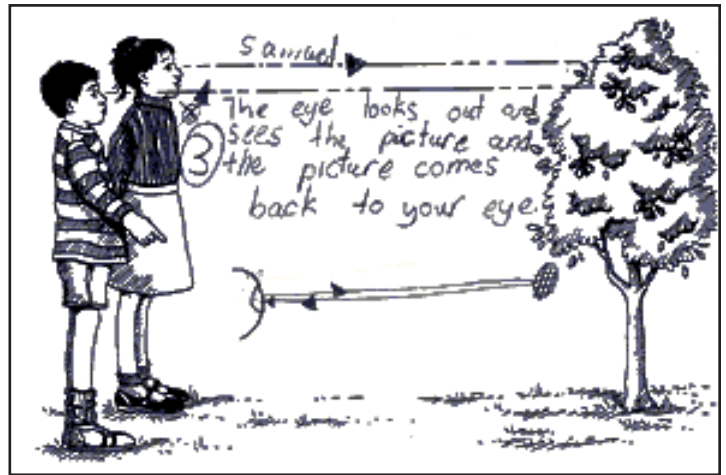
How Do We See? 2

WHAT THE WORK SHOWS

Samuel's text in the "before" view shows his current ideas about "how we see". The text in the "after" view shows how he has clarified and changed his ideas. He is close to constructing a scientific view of "how we see" but has not used the idea of sources of light in his explanation.



Samuel's "before" view



Samuel's "after" view

Progress Indicator Thinking in Scientific Ways

Suggesting explanations

Samuel's experiences such as reflecting light around the classroom, seeing light travelling, looking at signs, and the class discussions, lead Samuel to adopt a new explanation for "how we see" (see Samuel's "after" view). He suggests *cause-effect links for observations or events*.

Comparing and evaluating explanations

Samuel also clearly *accepts that his ideas may change if someone suggests a better one*.

Progress Indicator Developing and Communicating Scientific Understanding

Using scientific ideas in constructing explanations

In Samuel's "after" view he *constructs a plausible explanation for an experience, using some scientific ideas*. He now thinks of the eye as a receiver of the "picture", but has yet to link sources of light to his explanation (L3).