LEVEL 1 **2** 3 4 5

# Torches

## THE LEARNING CONTEXT

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

- observe and share their understandings
- identify, draw, and label the main parts of a torch circuit
- suggest how the different components of a torch work.

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

- Scientists use diagrams to record observations.
- Electricity only flows through a completed circuit.
- A circuit consists of a set of linked components.

The teacher provided a range of opportunities for the students to explore and develop an understanding of circuits. They were then able to try out their ideas and apply them specifically to a torch circuit. An important component of the unit was providing time for the class to try their ideas out before applying them to a real situation.

The teacher asked the students to begin exploring torch circuits by drawing an initial view of what they thought was inside a torch and explaining how it works. The teacher used the first drawing to determine the appropriate starting point for the unit. The class then brainstormed what they knew about torches before taking part in a series of exploratory activities.

These activities all followed the pattern: predict what you think will happen, try it out, share what you found, and explain why you think it was like that and what you have learned. To conclude the unit, the teacher asked the students to make another drawing to show what they now thought was inside a torch and how it works.

### Teacher-student conversation

Clarifying Elliot's thinking at the end of the unit:

| | |
|---|---|
| Teacher: | Tell me about how you think a torch works? |
| Elliot: | It works by a battery – it's got power in it. The power gets into the bulb, and a part gets hot and glows. |
| Teacher: | How do you think the power gets from the battery to the bulb? |
| Elliot: | By travelling through the metal bits. |
| Teacher: | Why do you think the battery runs out? |
| Elliot: | It's been worked; all its energy has gone. |

## WHERE TO NEXT?

To move Elliott towards the next learning step, the teacher could help him to try to construct the torch in the way he has drawn it. It would appear from Elliot's second drawing that the batteries are not aligned in the usual way. A suitable prompt could be: "Is it important that the batteries are put in a special way?" (investigating in science; developing and communicating scientific understanding).

The teacher could:

- encourage Elliott to investigate independent of teacher support by providing more opportunities to ask questions, predict outcomes, and carry out investigations
- encourage Elliott to continue to suggest plausible explanations of his observations and to make links to the scientific ideas.

## CURRICULUM LINKS

*Science in the New Zealand Curriculum*
**Achievement Objectives**

**Level 2: Making Sense of the Nature of Science and Its Relationship to Technology**
Students can investigate and describe how simple items of technology work.
*Science in the New Zealand Curriculum*, page 28
http://www.tki.org.nz/r/science/curriculum/p28_29_e.php

**Levels 1 and 2: Developing Scientific Skills and Attitudes**
**Information gathering:** Students can:

- make observations and simple measurements
- talk about their observations and measurements.

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

**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

## REFERENCE

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

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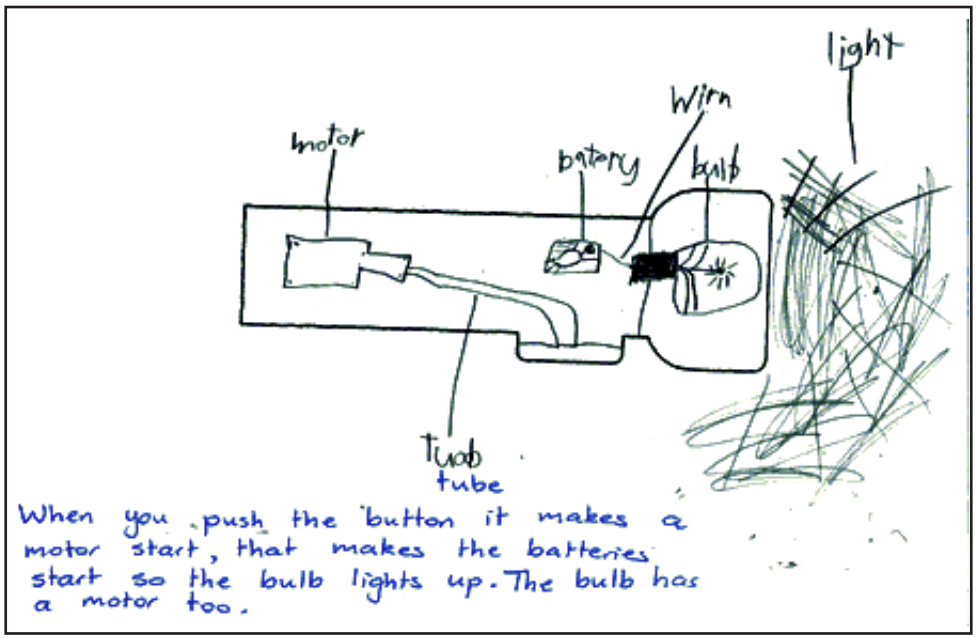
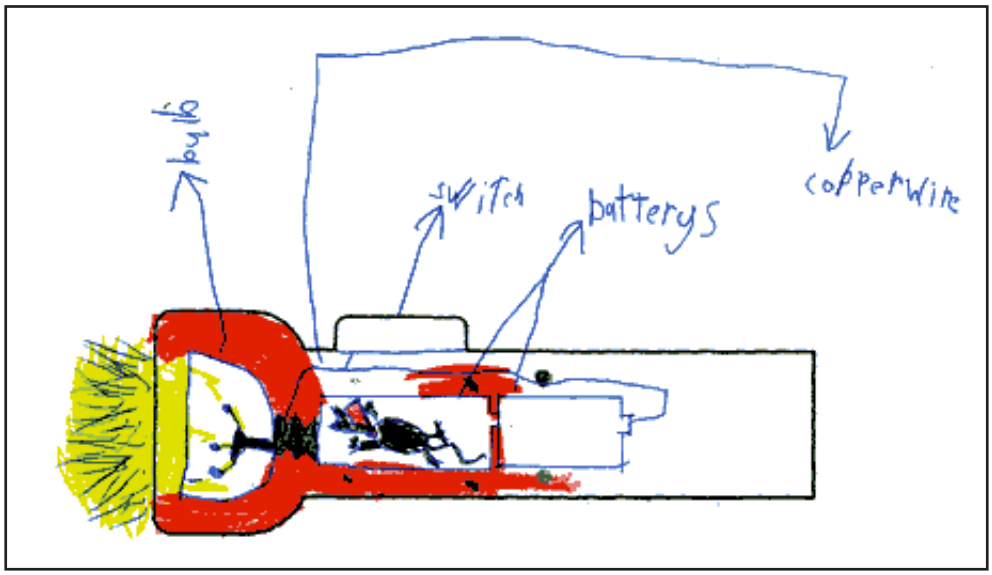
# Torches

## WHAT THE WORK SHOWS

Elliot's two pieces of work are part of an extensive unit exploring circuits and how they work. The supported investigation followed the same pattern throughout: predict what you think will happen, try out your ideas, describe what you think is happening, and explain what you think is happening and the reasons why it is happening. Elliot's work shows a shift in understanding from his initial clear but invented view to a more accurate explanation of how a torch works.




Elliot's initial drawing ("before" view)




Elliot's second drawing ("after" view)

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# Torches

## Progress Indicator
**Investigating in Science**

**Exploring a situation**
Initially, Elliot mistakenly thought that a motor inside the torch made it work. His "before" view shows that he *makes observations and looks for patterns or relationships* between a switch and the glowing bulb.

**Using systematic approaches and scientific conventions**
Elliot's "before" view also shows that he had *carried out simple trials based on his own ideas*.

**Processing and interpreting**
Elliot is moving towards level 2 in this aspect. With prompting, he *reaches a conclusion in a simple investigation* into how a torch works (L1).

**Reporting**
Elliott uses a diagram to *report on his investigation in an organised way*, referring to his observation that a bulb needs a circuit in order to give light.

## Progress Indicator
**Developing and Communicating Scientific Understanding**

**Exploring a situation**
Initially, Elliot mistakenly thought that a motor inside the torch made it work. His "before" view shows that he *makes observations and looks for patterns or relationships* between a switch and the glowing bulb.

**Using systematic approaches and scientific conventions**
Elliot's "before" view also shows that he had *carried out simple trials based on his own ideas*.

**Processing and interpreting**
Elliot is moving towards level 2 in this aspect. With prompting, he *reaches a conclusion in a simple investigation* into how a torch works (L1).

**Reporting**
Elliott uses a diagram to *report on his investigation in an organised way*, referring to his observation that a bulb needs a circuit in order to give light.