LEVEL 1 2 **3** 4 5

Keeping My Drink Hot!

THE LEARNING CONTEXT

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

- gather and record measurements (temperatures) taken over time
- identify trends and patterns in recorded data.

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

- Scientists work in systematic ways.
- Properties of materials determine their uses.

The class were studying insulation and exploring ways to keep liquid hot. The teacher wanted the students to understand how they could use a single type of material to gather temperatures. He modelled this concept and, in groups, the students selected one type of material and investigated its effect on the cooling rate of a cup of hot chocolate.

They observed what happened and each group shared their tabulated data with the class. The teacher supported them to graph three selected results. They identified trends and patterns and used their findings to answer the question, "Will insulation help maintain the heat in a cup of hot chocolate?"

The teacher wanted the students to understand the importance of carrying out the activity more than once for acceptable results, and to understand the necessity of accurately constructed tables and graphs.

Teacher-student conversation

During the investigation:

Teacher: Tell me about your experiment.
Caroline: I've got cotton wool. I'm testing to see how good it is at keeping water warm in a cup.
Teacher: How are you recording your data?
Caroline: I measure the temperature every fifteen minutes and write it down. The first one is without any insulation, but I do the same measurements with the cup wrapped up in cotton wool.

WHERE TO NEXT?

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

- importance of carrying out the activity more than once for acceptable results
- accurate construction of tables and graphs, and to look for multiple trends within the gathered data
- evaluate the strengths and weaknesses of the investigation, and decide on improvements (investigating in science)
- features of fabric that best insulate the cup (developing and communicating scientific understanding).

The teacher could:

- provide opportunities for her to carry out another investigation in a different context using her own question (investigating in science)
- encourage her to organise her data and look for trends, patterns, and simple relationships within them (investigating in science).

CURRICULUM LINKS

Science in the New Zealand Curriculum
Achievement Objectives

Level 3: Making Sense of the Material World
Students can investigate and describe how the physical properties of materials are related in their use.
Science in the New Zealand Curriculum, page 94
http://www.tki.org.nz/r/science/curriculum/p94_95_e.php

Levels 3 and 4: Developing Scientific Skills and Attitudes
Reporting: Students can identify trends and relationships in recorded observations and measurements by making links within organised data.
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

REFERENCE

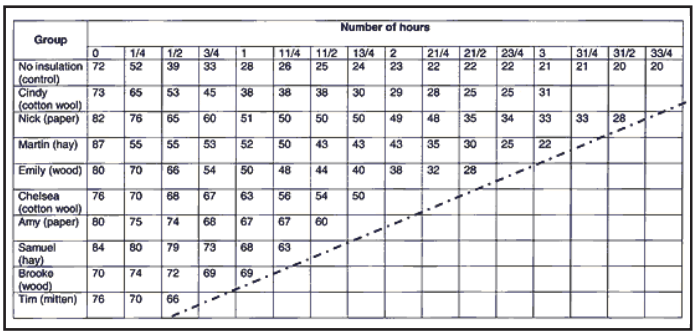
Ministry of Education (1993). *Science in the New Zealand Curriculum.* Wellington: Learning Media.

LEVEL 1 2 **3** 4 5

Keeping My Drink Hot!

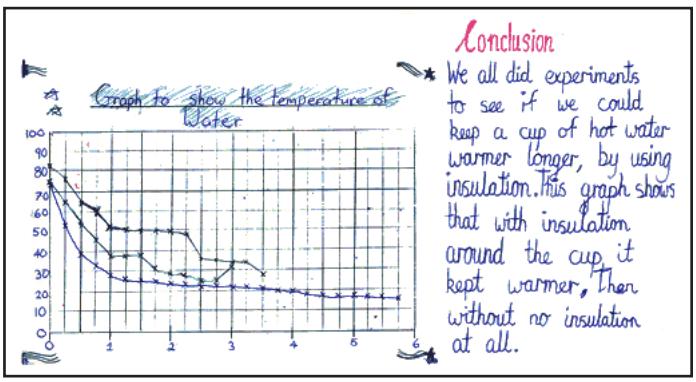
WHAT THE WORK SHOWS

Caroline's graph shows she can identify trends and patterns in data relating to different types of insulation, and apply the findings to a real life situation. She transfers an independent collection of data on to a graph, with teacher support.

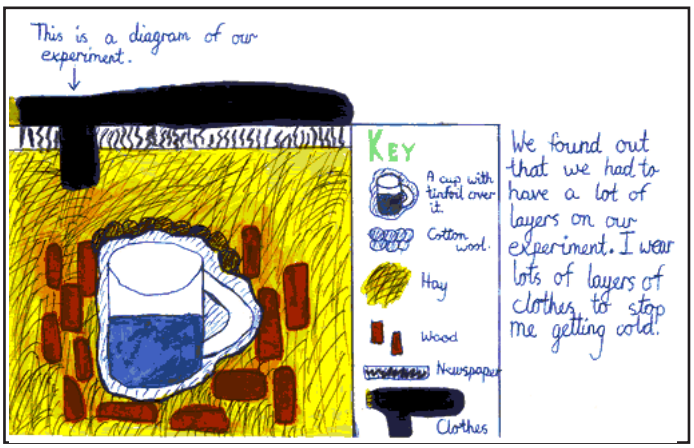


Group	Number of hours															
	0	1/4	1/2	3/4	1	11/4	11/2	13/4	2	21/4	21/2	23/4	3	31/4	31/2	33/4
No insulation (control)	72	52	39	33	28	26	25	24	23	22	22	22	21	21	20	20
Cindy (cotton wool)	73	65	53	45	38	38	38	30	29	28	25	25	31			
Nick (paper)	82	76	65	60	51	50	50	50	49	48	35	34	33	33	28	
Martin (hay)	87	55	55	53	52	50	43	43	43	35	30	25	22			
Emily (wood)	80	70	66	54	50	48	44	40	38	32	28					
Chelsea (cotton wool)	76	70	68	67	63	56	54	50								
Amy (paper)	80	75	74	68	67	67	60									
Samuel (hay)	84	80	79	73	68	63										
Brooke (wood)	70	74	72	69	69											
Tim (mitten)	76	70	66													

Caroline's graph



Caroline's explanation of her data



Caroline's diagram of her experiment

Progress Indicator
Investigating in Science

Exploring a situation
Caroline *makes a series of observations and looks for patterns or relationships,* in the data relating to her graph.

Using systematic approaches and scientific conventions
Caroline *plans and carries out more systematic trials using measurement to identify patterns and test ideas*.

Processing and interpreting
Caroline *organises data to display obvious trends and patterns and to reach conclusions* and transfers data to a graph with teacher support (see Caroline's graph).

Progress Indicator
Developing and Communicating Scientific Understanding

Using scientific ideas in constructing explanations
Caroline *constucts a plausible explanation for an experience using some scientific ideas* when she compares how she keeps a drink warm to using layers of clothes to keep warm (see Caroline's diagram of her experiment).

Reflecting on their own understanding
Caroline *discusses changes in her scientific ideas* in her conclusion.