'CHILDREN'S SCIENCE'

Ian Milne *explores how to get children thinking scientifically at primary school*

The revamped New Zealand curriculum emphasises '*scientific literacy for all students*' and provides teachers with an opportunity to promote science as an integral element of the primary school curriculum. Exploring and explaining the natural world in primary science can provide authentic contexts for the development of knowledge, skills and attitudes associated with enquiry learning, especially focused questions and thinking skills.

Children of primary school age frequently seek to explain their experiences in and of the natural world. The explanations they construct are often different from the existing scientific explanation. These personal explanations can be referred to as a child's personal science: '*I think this because ...*'. The '*because*' is the child's evidence to justify the explanation. If we take science to mean 'the current explanations of nature / the natural world and the evidence used to validate explanations', then it can be argued that when children create explanations that are supported by evidence, they are thinking in a scientific manner. Primary science education therefore is about children thinking. It requires teachers to take children's ideas and explanations seriously as they do science. It is about 'children's science'.

What does this mean for the teacher in the classroom? What knowledge, skills and attitudes should a primary school teacher be looking for when evaluating children's ability to think and act scientifically? Or alternatively, what does scientific literacy look like for primary school age children? It would appear that there are three interdependent elements involved in doing science that need to be recognised by those involved:

- Science is about exploring and explaining observable phenomena.
- Science is about a process used to find an answer to a question.
- Science is about having reasons for your thinking (evidence).

This does not mean that teachers blindly accept and work with children's explanations. A fundamental aspect of science, including children's science, is the notion of validity and the acquisition of the evidence that the explanations are based upon. Their evidence has therefore to be challenged as part of the science process.

The nature of science in the NZ curriculum proposes four key aspects:

- Understanding about science.
- Investigating in science.
- Communicating in science.
- Participating and contributing.

These aspects provide a useful framework for developing programmes that will assist teachers to challenge children's thinking and hopefully move them towards creating explanations that are closer to the current thinking in science. 'Creative exploration', as detailed in Table 1, is a model for developing personal explanations and understanding in primary science.

A feature of creative exploration is the inclusion of exploratory activities that, with teacher direction and input, provide aesthetic experiences of natural phenomena to promote enthusiasm for understanding and explanation amongst the learners involved. The children's active involvement leads to a need to communicate their explanations to others. This approach encourages the use of a range of communicating strategies, including role play and drama, formulating tables and using symbols, as demonstrated in some of the 'top 20' activities in this issue (e.g. 'Ice hands' and 'Bishops can fly').

Table 1 **Sequential elements of the 'creative exploration' model for developing personal understanding in primary science**

Creative exploration		
Explore	Explore a problem, situation, phenomenon, artefact, model, event, story	**Wonder**
Observe	What is happening? What changes happened? What materials are involved? What are the main parts? What are the key aspects? What do these parts/structure do?	**Wonder about**
Identify evidence	What is the cause and effect of changes? What is the function? What parts are interacting with other parts? What are the outcomes of these interactions? What trends and patterns keep occurring?	**Wonder at**
Create explanations	Personal explanations supported by evidence are created and processes to test them are planned	
Investigate	Find out, measure, compare, verify, test, clarify identify	
Evaluation	A self-evaluation of these investigations may lead to new or modified explanations, doubts about existing ideas or tentative conclusions. These tentative explanations can be communicated to others for peer-evaluation and feedback	**Wonder whether**
Further investigation	Evaluated explanations can lead to: re-exploration, seeking further explanation, further investigation	

Although creative exploration is still in a developmental stage, it does identify significant practices that could be beneficial for teachers when reviewing their practices. It stresses the importance of making the learner realise that exploration is part of science and that, through close observation and wondering, patterns and trends can be identified. The testing and further investigation of these tentative observations and evidence through systematic enquiry can lead to validated explanations that can be communicated to others. In short, children are using scientific processes to create explanations that are new to the individuals involved. They are doing science, 'children's science'. Is this a big change for children – and their teachers?

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