

Precision in the understanding and

USE of Scientific Vocabulary

WORDS
IN SCIENCE

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OFFERS ADVICE ON
ENABLING CHILDREN TO
DEVELOP AND USE
SCIENTIFIC VOCABULARY
ACCURATELY

Raising achievement through the use of scientific vocabulary

Analysis of the national key stage 2 science test scripts for 2000 (QCA, 2001) and 2001 (QCA, 2002) indicates that the use of accurate, scientific vocabulary is associated with higher levels of overall attainment. Children achieving level 3 overall tended to use everyday language to express their ideas and showed a greater tendency to confuse technical scientific terms. For example, in the 2000 national tests:

■ In the test question on *Shadows*, use of the words translucent and opaque to describe differing properties of plastic and card was more common amongst pupils gaining levels 4 or 5 and almost absent amongst those achieving level 3 overall. Lower achievers often suggested in everyday language that card doesn't let light through and plastic lets more light through.

■ In the test question on *Growing seeds*, almost one third of those achieving level 5 overall used the term *photosynthesis* (although it is not explicitly stated as a requirement in the

key stage 2 programme of study) compared with one tenth of those gaining level 4 and fewer than 1 per cent at level 3.

The QCA reports claim that the use of more technical scientific vocabulary demonstrates more accurate understanding, and that using correct scientific vocabulary as they learn helps children's understanding to develop (QCA, 1998). However, achieving lower national test levels for failing to use precise vocabulary does not necessarily indicate lower levels of understanding. As Brenda Prestt (1980) states, children often use scientific terminology as verbal wrapping paper to conceal the fact that they don't understand the concept being presented. Children's use of a technical term may not necessarily indicate understanding, but that they know when to use a particular word.

Tables 1 and 2 indicate vocabulary that was required to be either written and/or understood to answer national test questions successfully in 1999 and 2001. Many children

were found to confuse *dissolving* and *melting*, *shadow* and *reflection*, *permeable* and *non-permeable* and *rotation* and *orbit* (QCA, 2000, 2002).

Introducing scientific words

Wynne Harlen (2000) describes how young children often enjoy using technical terms and collecting

dissolving	melting
evaporation	condensation
orbit	rotation
predator	prey
consumer	producer
reflection	permeable
pitch	volume

Table 1 Vocabulary required to be written or understood in 1999 key stage 2 national tests (from analysis of Test A and Test B levels 3-5) (QCA, 2000)

permeable	mass
melting	evaporation
conduction	gravity
reflection	orbit

Table 2 Vocabulary required to be written or understood in 2001 key stage 2 national tests (from analysis of Test A and Test B levels 3-5) (QCA, 2002)

Turning the tables!

Not only might children experience difficulty in learning new words to describe scientific phenomena but also in realising that many scientific terms have quite different everyday meanings. Examples of such ambiguous words are *table*, *volume*, *force*, *bulb*, *flower*, *fruit*, *key*, *material*, *fair*, *consumer*, *conductor* and *circuit*. As

John Stringer (1999) indicates, a child may be totally confused when, having learned that a table is something with legs to sit at to eat or write, he is then asked to record his science findings in a table! This may be even more perplexing if English is that child's second language. Louise Endersby, a primary PGCE student at Brunel University on her first block school experience, demonstrates this confusion in two children's drawings from her unpublished work. Her year 1 children had carried out a class investigation and Louise had drawn a table for results on the board in which she entered their findings. These 6-year-olds had engaged in the discussion and had apparently understood the format being presented. They busily got down to drawing the table for themselves whilst Louise worked with a group that was experiencing difficulties. Only near the end of the lesson as she moved around the classroom did she realise that Kyle (see Figure 1) had recorded her tables of results complete with pencil tidy-tubs and her friends sitting on their chairs, while Matthew (with Arabic as his first language) had included the number-line stuck along his table in addition to the chairs (Figure 2).

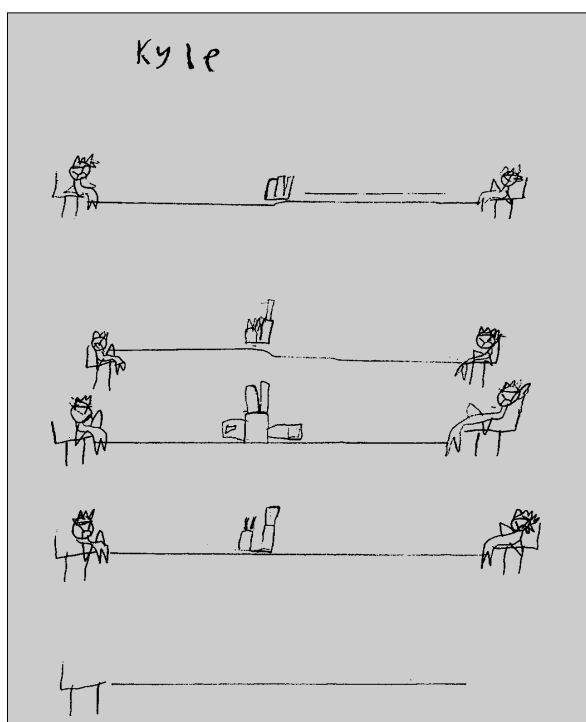
In science a *flower* is the reproductive unit of a plant and not the name for the entire plant as in everyday usage. A *fruit* is a swollen ovary and thus includes marrows, aubergines and pea pods which are vegetables when shopping! In the supermarket we refer to the *weight* of these fruits or vegetables but in their science lessons this is *mass*.

new words which they may not entirely understand. She proposes that teachers should welcome children's 'loose' use of words as a transition towards a more refined and accurate understanding. She believes, however, that it is important to be aware of the nature of the child's incomplete meanings. It would be inappropriate to accept conceptually misleading words such as a magnet 'sticking' to a paper clip, wrongly suggesting some adhesive quality. It would be preferable to encourage use of the words 'pulling' or 'holding' the paper clip, which are scientifically correct yet simpler than

using the term 'attracts'. A dilemma faces the teacher in identifying the right time to introduce appropriate terminology. Introducing a word too soon may encourage a verbal facility that conceals misunderstanding, but the use of a more technical term may enhance precision in thinking and communication. Wynne Harlen suggests that until the child appears to need a scientific term (e.g. *vibrate*) we use the language adopted by the child (e.g. *shivers*), unless it is conceptually misleading. However, 'if a word will fill a gap, a clear need to describe something which has been experienced and is real to the children, then the time is right to introduce it' (Harlen, 2000, p. 116).

Rosemary Feasey (1999) suggests that scaffolding is an effective way of enabling children to develop accurate use of vocabulary, with the teacher using the everyday language and the scientific terminology together until the new words become as familiar as the old. The teacher might say that 'the puddle has evaporated with the liquid (runny) water changing to water gas or vapour in the air'. The everyday words can then be gradually omitted from the discussion and the scientific terms adopted in their place.

Figure 1 Kyle's drawing of her 'tables of results' includes her seated friends and pencil tubs



Matthew * K Yrbou

(Arabic for language)
6.9 years

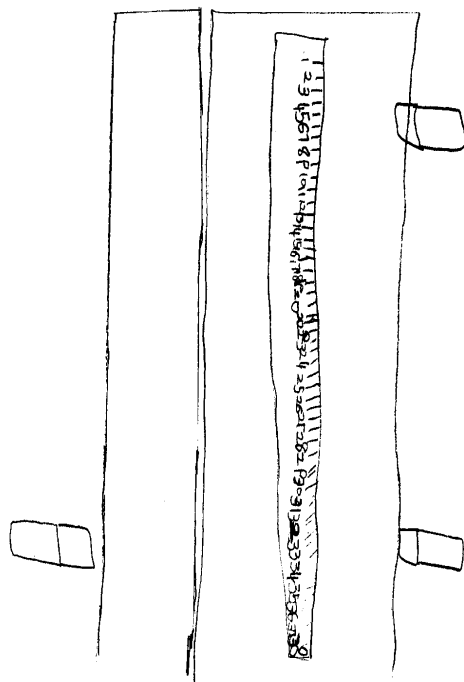


Figure 2 Arabic-speaking Matthew's results table complete with number line and chairs

We may achieve this through:

- being entirely explicit about ambiguous words and contrasting everyday and scientific usage;
- scaffolding scientific terminology with everyday language;
- displaying pictures and diagrams labelled with scientific vocabulary and scaffolded by children's terminology;
- creating a class dictionary related to each science topic;
- emphasising and using the vocabulary outlined in each unit of the QCA science scheme of work (QCA, 1998);
- using Cloze procedure and wordsearch activities with that vocabulary;
- modelling vocabulary in class talking and writing activities.

At a time when literacy and numeracy hours are dominating the primary curriculum and may be reducing the frequency with

which science is taught in many schools, some integrated vocabulary work in English and science may help to raise children's capabilities in both core subjects.

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Strategies for developing scientific vocabulary

So if we are to enable children to be more successful in science, to think and communicate more precisely, and to achieve a higher level in key stage 2 science national tests, we need to enable children to develop and use scientific vocabulary accurately.

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