Scientific literacy teacher document

Problems with scientific vocabulary.

1. Some scientific words have everyday meanings as well as scientific meanings. It is important to make pupils aware of these differences. Constant reinforcement is needed to encourage correct usage. Scientific definitions of words should be made clear and distinctions made from everyday meanings.

   Words with everyday meanings include:

   Force often used interchangeably with energy and power; will probably have everyday associations rather than the scientific concept.

   Energy often used interchangeably with force; linked to the everyday notion of energy being used up or running out, which will lead to misconceptions.

   Material although introduced with a scientific meaning in Key Stage 2, the everyday meaning often persists through Key Stages 3 and 4.

   Dissolve sometimes used interchangeably with melt, even though introduced correctly in Key Stage 2.

   Tissue has a distinct scientific meaning but also has an everyday meaning.

   Other words with different everyday and scientific meanings include weight, power, mole, reflection, pure, matter, bulb, cell, current, key, plastic, circuit

2. Many scientific words have been developed systematically. Knowing this can help pupils spot patterns and so develop their scientific understanding – for example, knowing that the word root **chlor** means green, and that within the name of a compound this could indicate the presence of a chlorine atom. This will aid understanding. Misspelling of words can lead to these patterns being missed. For example:

   Hydraulic acid A fairly common mistake; pupils miss the point about the chlorine atom being present.

   Sodium It is not always easy for pupils to accept sodium as a metal. Knowing that the suffix -ium has been taken to mean ‘metal’ provides pupils with a powerful tool for recognising metals from names.

   Photosinthesus Misspelling the word misses the word root, syn-, so pupils are unable to connect the word with the notion of building or putting together.

Key word strategies

A key word is one that helps pupils communicate ideas in science clearly. Insist on the correct pronunciation and lots of practice saying the words out loud.

Consider:

- **Dividing vocabulary** lists into those that all pupils must know (the absolutely key words): words that it would be useful to know: words that are for the most able.
- **Identifying** for pupils which key words are:
  - **Names of objects/structures** eg artery, granite, hydrogen
  - **Processes** eg evaporation, respiration, digestion
  - **Concepts** eg energy, force, atom

Names are the simplest words to understand. Some processes cannot be seen easily so can cause problems in understanding. Concepts are largely abstract and even though they might be easy to read they are nevertheless difficult to understand.

- **Use the following process for introducing new vocabulary:**
  - Introduce the word (is it a name, concept or process?).
  - Write it on the board.
  - Say the word.
  - Ask pupils to say the word out loud.
  - Break the word down into syllables; point out similarities with other words, use mnemonics to remember spellings if necessary.
  - Ask pupils to read the word as it is used.
  - Ask pupils to use the word in a description or explanation.
- **Use syllabification:** break down the word into syllables – get them to say it, write it and read it: e.g. ox-y-gen, di-ges-tion, re-spir-a-tion, It is important to say the words aloud.
- **Grouping words:** talk to pupils about words with similar patterns: e.g. -tion endings for processes – nutri-tion, filtra-tion, distilla-tion e.g. -ic endings for acids – sulphur-ic, nitr-ic, hydrochlor-ic.
- **Making links** with those words they already know: e.g. electrode from electron, filtration from filter.
- **Remind pupils of spelling rules** – check what the English department use: e.g. ‘i’ before ‘e’ except after ‘c’.
- **Encourage pupils to make personal dictionaries/ glossaries of key words.**
- **Spelling:** ask pupils to use mnemonics, or memory hooks, to remember troublesome words: e.g. diarrhoea - Down In Africa Red Riding Hood Only Eats Apples eg laboratory - Lab or a Tory (humour) eg saying a word differently can help such as Elec-trol-Y-sis
- **Use ‘look, say, cover, write, check’.**
- **Calligrams:** exaggerate part of the word to help illustrate its meaning is helpful, for example, making the double ‘ll’ in parallel much longer when writing it on the board.

Scientific Vocabulary Games

Activities that have a ‘game-like’ feel can help pupils gain confidence with scientific vocabulary.

Consider:

- **Loop card games** -pupils are dealt a set of cards, each with a question and an answer to a different question. Beginning with any pupil reading out their question, the pupil with the corresponding correct answer is required to read it out. That pupil then reads their question for another pupil to answer. A loop game is constructed so that the sequence ensures that all questions and answers must be used. In a loop game the sequence always arrives back at the first question. (See Loop Card examples).
- **Dominoes:** prepare the cards as a set of dominoes. Cut out each card so its question and an answer form one ‘domino’. Shuffle the cards. Pupils play by finding the answer to a question on a different card. Match all the questions with their correct answers and you will be able to form a complete loop. (See Dominoes examples).
- **Taboo:** the cards contain words that pupils are not allowed to use. These can be made more or less difficult depending on the number of taboo words you use. A group of pupils has a set of cards which are face down. One pupil selects a card and has to give the rest of the group clues as to what the word is without using the taboo words. The pupil who guesses correctly selects the next word.
- **Producing key words and meanings** on separate cards which can be used in different ways
  - pupils can sort into pairs and justify pairing. Discuss different ‘pairings’
  - pupils can sort into three’s and again justify
  - arrange in three’s and ask pupils which is odd one out
  - pupils match word and definition
  - teacher reads out word or definition and pupils find match from their set.

Some Useful Word Roots

Root	Meaning	Root	Meaning
aer	oxygen	iso-	the same
allel	different	lign	wood
amphi-	both	lys	break down
ante-	before	macro-	large
anti-	against	micro-	small
arthr	joint	myc	fungus
bi (bio-, -biotic, -be)	life	-oid	resembling
bi-	two	-on	a unit
cardi	heart	-ose	a carbohydrate
chlor	green	peri-	around
cyt	cell	phot	light
derm	skin	sapr	decay
di-	two	spir	breathe
dia-	across	stoma	mouth
ecto-	outside	sym-, syn-	together with
endo-	inside	therm	heat
gam	mating	trans-	across
ge	earth	troph	feeding
graph	write	vas	vessel
gyn	female	vor	feeding
haem	blood	xyl	wood
hydr	water	zoo	animal

Word roots in naming elements and compounds

In the eighteenth century, Antoine Lavoisier was credited with the development of the modern view of elements and compounds and is sometimes dubbed the 'father of modern chemistry'. The systematic naming of compounds saw a major revolution from this time onwards.

- New metals that were discovered were to end in **-ium**.
- Acids ending in -ic lead to the formation of salts with names ending in **-ate** (or sometimes **-ide**).
- Acids ending in **-ous** lead to the formation of salts with names ending in **-ite**.
- The suffix **-ide** indicates a compound of two elements (except for hydroxide): the name of one of the elements in the compound takes the –ide to show this e.g. oxygen – oxide: sulphur- sulphide: iodine- iodide. An –ide ion is always negative
- In simple terms **-ite** and **-ate** can be related to the amounts of oxygen in a group of atoms in the salt. (-ate has more oxygen than -ite)