

I used to be an English teacher. I also have long-standing interest in metaphors. So, when my own children reached a certain age, I asked them if they had been given 'the talk' yet. That is the lesson when their English teacher tells them where metaphors come from. I guess all children are given a similar talk when their teacher thinks they are ready.

The talk usually starts off with the story of the squashed simile. The teacher says: 'if we write *Juliet is like the sun* we are using a simile; when Shakespeare writes *Juliet is the sun* he is using a metaphor.' It's a useful starting point but, obviously, it is not the end of the story. With luck and good teaching, children will go on to recognise metaphor as a tool of great subtlety and variety, used by writers to infuse their work with wit, originality and imaginative power.

I don't expect that teachers and children will pay much attention to metaphor other than in English lessons. Yet maybe they should. For metaphorical thinking in its widest sense, including the use of analogies, has a huge influence on the way we understand, learn and remember *everything*.



**Metaphors and analogies are powerful tools for teaching and learning. Steve Williams explains why**

# Metaphorical thinking

### What is metaphorical thinking?

In 1936, I. A. Richards provided us with a useful description of metaphorical thinking as the linking of a *topic* and a *vehicle* through a common *ground* (Richards 1936). The topic is what the metaphor is about. In Romeo's statement that *Juliet is the sun*, for example, the topic is Juliet. The vehicle is the means by which the speaker refers to the topic. So in this example, the sun is the vehicle. The ground is the sum of possible attributes shared by the topic and vehicle. They never share all attributes and the metaphor is never merely a comparison by another name. As Ellen Winner (1997) points out, 'Romeo's statement might mean that Juliet is the sun because she is beneficent, because she is central to Romeo's life, because she is necessary for his existence and so on.'

The success of a metaphor depends on the way it invites us to see the topic using some properties of the vehicle as a lens. The same can be said of similes and analogies, which both share this topic-vehicle structure. Metaphorical thinking transforms the way we perceive topics. This has great significance for discovery and learning because we are able, through the use of metaphors and analogies, to perceive things we do not understand through the lens of things we do.

### Learning through metaphor

Metaphors and analogies illuminate all kinds of concepts. Williams Harvey described the heart as a pump and, as Jonathen Miller pointed out, we couldn't know much about how the heart worked until the water pump was invented (Millar 2000). Niels Bohr described the atom as a tiny solar system with the nucleus in the centre and the electrons orbiting like planets around it. The concept of weather fronts was introduced by Vilhelm Bjerknes, who likened the conflicting interactions between warm and cold air masses to the European battlefronts of World War One. As well as helping us to understand new topics by framing them in terms of familiar ones, metaphors also help us memorise concepts because they provide strong, often visual, associations between the topic and the vehicle. Memory, as Tony Buzan (1995) writes, is substantially improved by acts of association.

Metaphorical thinking helps children as much as it does adults. This has been demonstrated in several research studies. For example, Vosniadou and Ortony (1983) gave six and eight-year-olds two kinds of text to read. One group received texts in which the functioning of white blood cells was described by an explicit analogy to soldiers. The other group received the same subject but without the analogies. The researchers tested the children's understanding and recall of the blood cell topic and found that the group who have been given the analogies performed much better. Interestingly, the children were also able to infer grounds that were appropriate to the topic. They realised that if white blood cells are like soldiers, they function to protect; they did not infer that the cells wear uniforms or that they carry



Soldiering – a metaphor for the activity of white blood cells

guns. Other research confirms that children's learning can benefit from appropriate analogies, yet one survey found that very few analogies are used in school textbooks (Dixon, Ortony and Pearson 1980).

Children are able to create their own analogies from an early age – first through play and then as a tool for clarifying concepts. Ellen Winner (1997) cites the example of a six-year-old who was 'trying to understand the concept of medical side effects and asked her mother if the side effects were like using a pair of scissors to open a can and bending the scissors in the process.'

Children's understanding of analogies seems limited only when they don't understand the vehicle and hence the grounds on which the analogy is based. So, for example, children would not benefit from the blood cells analogy if they knew nothing about soldiers. Also, their understanding of metaphors further depends on them being able to infer that a given metaphorical phrase is not meant to be taken literally. If these conditions are met, children seem to have no problems understanding and creating analogies and metaphors.

In fact, Lakoff and Johnson (1999) suggest that metaphorical thinking is inescapable because we perceive the whole world through a lens made of 'primary metaphors' which we start to learn at a very young age. For example, an infant feels warm when being held affectionately by its parents. *Love* and *affection*, then, are understood naturally through the concept of *warmth*: 'I gave her a *warm* hug'. A child also finds that big things like parents are important, hence the feeling that *important* is *big* as in: 'tomorrow is a *big* day.'

Lakoff and Johnson also argue that metaphorical thinking provides a vehicle for us to transfer reasoning from one domain of knowledge to another. Take, for example, the analogy that love is like a journey. The lovers are travellers, their common goals are destinations, obstacles are impediments to motion and so on. The analogy not only permits the use of travel words to speak of love; it invites

forms of *reasoning* about travel to be used in reasoning about love. So *if* lovers are *stuck* in a cul-de-sac, *then* they cannot continue to *travel* together towards their *destination*.

This sheds some light on the argument about whether reasoning skill is limited to specific domains of knowledge or can work across domains. Perhaps reasoning often crosses (or bridges) domains via the sort of metaphorical transfer described by Lakoff and Johnson. But once reasoning from one domain is applied to a different one, it must be tested, refined and constantly reviewed. It does not make sense to say that reasoning cannot cross subject boundaries at all. In the history of knowledge we can find many instances where reasoning from the sciences has been applied to the humanities and vice-versa.

### Metaphors for misunderstanding

Though metaphors are powerful tools for enhancing our understanding, they can also wreak *misunderstanding* in every mind they touch. And because metaphors and analogies hook themselves into our memories so effectively through association, they are very difficult to shift.

Alistair B. Fraser, writing on his website *Bad Science*, is concerned that many students believe, and are often taught, that the reason clouds form when air cools is because cold air cannot *hold* as much water vapour as warm air. Fraser argues that the metaphor of air as a container causes needless misunderstanding: 'Clouds are not caused by some mythical temperature-dependent holding capacity of air.' His own explanation relies more on the financial metaphor of profit and loss. He says: 'As air is cooled, the evaporation rate decreases more rapidly than does the condensation rate. When there is *net* condensation, a cloud forms.'

Even great thinkers can be misled by metaphors. Charles Darwin puzzled over the principles of heredity for many years because he supposed, following the appealing metaphor of mixing inks, that parental characteristics were combined in the offspring by a kind of blending. This didn't fit with observations of things like red flowers which, when crossed with white flowers, often produced offspring

that were all red or all white. It was Gregor Mendel who discovered that the inherited characteristics were caused, not by some inherent ink-like property, but by discrete 'factors' that later came to be known as genes.

The lesson here is that we should analyse the *grounds* of analogies and metaphors very carefully in order to judge whether they are appropriate. As George Eliot observed in *Middlemarch*: '... all of us, grave or light, get our thoughts tangled in metaphors, and act fatally on the strength of them.'

### Metaphorical thinking across the curriculum

How can teachers use metaphors and analogies to help young people understand, reason and remember better? How can teachers help untangle the thoughts of their metaphor-bound pupils? The following ideas are offered as starting points.

**Use analogies to illustrate concepts.** When planning a lesson, identify the main concept you will be teaching. Think of possible metaphors and analogies to illustrate the concept. Then choose one that is most appropriate. Plan ways to discuss the grounds of your analogy with pupils to avoid misleading them. Make sure your pupils have sufficient knowledge to understand the vehicle that generates your metaphorical thinking.

**Invite students to share their own analogies.** The process of creating metaphors and analogies is good fun. It

also helps pupils to express their ideas in striking, memorable ways. However, the main benefit of creative, metaphorical thinking may be its power to open the minds of pupils to fresh viewpoints. We are all attached to our opinions and ways of seeing the world. Metaphors can turn our thoughts in new directions with relatively little resistance because they transform our ways of seeing. For example, pupils in PSHE might come up with the following metaphors when considering rules, laws or customs: *shield*, *guidebook*, *prison*, *handcuffs*, *teacher*, *burden*. Sharing, analysing and comparing the metaphors will help pupils to explore the concepts in question from a variety of perspectives.

We should be aware that people from different cultural traditions might use different vehicles and grounds for their



Mixing coloured liquids – a misleading metaphor for heredity



French revolution – a storm on the horizon

analogies about the same topics. Inviting pupils to share analogies could be a useful strategy with which to stimulate discussions of culturally-based differences in perception.

Teachers of science should pause before inviting pupils to create their own metaphors about scientific concepts. It is certainly true that misleading metaphors may 'stick' and cause misunderstandings. C. S. Lewis (1962) contrasted what he called 'Pupils' metaphors' with 'Masters' metaphors'. He argued that 'Masters' invent metaphors to explain topics they fully understand. Pupils' metaphors, on the other hand, represent the limits of their authors' comprehension of concepts. This may be true, though the limits of pupils' understanding is precisely the information teachers need in order to plan future lessons. There is considerable research (Osbourne 1985) to show that children's mistaken reasoning about a variety of topics in science can remain uninfluenced by science teaching. Children's reasoning is often metaphorical, so we had better know what metaphors influence each child's thinking about the topics we plan to teach.

**Discuss the grounds for metaphorical thinking with pupils.** It is important to help children develop the habit of considering the appropriateness of metaphorical thinking by analysing the grounds for particular metaphors and analogies. This process can be used to stimulate critical thinking. For example, in history, pupils might consider whether the period leading up to the French revolution was like the building up of a thunderstorm? How might it, and how might it not, be like that?

**Compare significant metaphors from different cultures.** Our cultural and intellectual heritages contain many significant metaphors that have shaped the way we think – for good or ill. They are part of our intellectual inheritance. In the western tradition, Descartes compared the human mind to the pilot of a vessel. This idea – that the body is a machine guided by the mind – has been with us, in one form or another, ever since.

Philosophers have used the Greek fable of the *Ship of Theseus* as an analogy for the continuation of identity through change. The story tells of a long journey home for Theseus and his men. Each of the boards of their ship has to be replaced until all the boards are new. The puzzle is to say whether the old ship ceased to exist. If it did, then at what

point would we say the ship was new? The *Ship of Theseus* has been used as an analogy to explore many different kinds of changes. Gareth Matthews (1984) writes about discussing the story with children aged between eight and eleven. He reports: 'the excitement of that discussion is hard to describe. Everything flowed naturally, yet the analogies, the rhetorical flourishes, and the sudden insights burst on us like a firework display.' We should follow his lead by sharing and exploring significant analogies with children.

I have argued that we ought to take metaphorical thinking seriously in education. I have also suggested a few practical applications of such thinking across a range of subjects. I would be interested in your views and your experiences of using metaphors and analogies with pupils.

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