

# Addressing students' misconceptions

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article



## Why misconceptions are important

We know that it is important to find out what students already know before we start teaching.

The NZ Curriculum states that “students learn best when they are able to integrate new learning with what they already understand”.<sup>1</sup> This prior knowledge influences how they think about, make sense of and organise incoming information. If students learn new things by making connections to what they already know, then eliciting prior knowledge allows teachers to make sure the planned work is appropriate for the students in front of them.

Some of this prior science knowledge includes misconceptions, formed as students try to make sense of the world around them. For example: It is hotter in summer because we are nearer the sun; the group animals includes dogs but not spiders; all metals are magnetic or a neutralisation process always produces a neutral product. If new knowledge is to be built on a strong foundation, teachers need to be aware of students' misconceptions and work to address them.

In *The hidden lives of learners*,<sup>2</sup> Graham Nuthall says a central job of teaching is changing students' well-established but inaccurate beliefs. The NZ Learning in Science

project<sup>3</sup> also did some important research in this area, focussing on how we can address misconceptions about electricity, floating and sinking, dissolving, and plants, among others.

## Identifying misconceptions

It is important that students get the opportunity to explain their understanding using their own words. Useful strategies:<sup>4</sup>

- **T/F statements** – ask students to justify their answer
- **Concept cartoons** – ask students to say who they agree with and why.
- **Images** – ask students to explain what they see in a storyboard, photo or diagram
- **KWL** – ask what students Know, Want to know (and later how they Learnt it).

Concept cartoons provide a range of viewpoints about a science idea in real-world situations, and are designed to stimulate discussion and bring misconceptions to the surface. They encourage students to clarify their scientific thinking as they justify their own ideas and consider other points of view. Concept cartoons are easy to find in Google images or in the book *Concept cartoons in science education*.<sup>5</sup> The [Science Learning Hub](#) has [suggestions](#) on how to use concept cartoons.



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During the teaching of any topic, students need to be given opportunities to confront their misconceptions. Asking other students to explain why misconceptions are incorrect is more effective than an explanation from a teacher.

Students could be asked to discuss their answer to the T/F statements, concept cartoons or images with a small group to come up with a consensus. This enables students to work together, discussing various points of view, defending their own arguments and listening to others. Students can also tackle misconceptions through practical activities or everyday applications where they have to explain what happens using scientific principles.

It is important to get students thinking - brainstorming, activity circuses, spider diagrams, discussion questions, and student reflections are all useful. Giving students a voice in the classroom is key.

We will address specific student misconceptions in upcoming issues of the newsletter.



## References

- 1 Ministry of Education (2007). *The New Zealand curriculum*. Wellington, NZ: Learning Media
- 2 Nuthall, G. (2007). *The hidden lives of learners*. Wellington, NZ: NZCER Press.
- 3 Bell, B. (2013). *Learning in science: The Waikato research*. London, UK: Routledge.
- 4 National Research Council (1997). *Science teaching reconsidered: A handbook*. Washington DC, USA: The National Academies Press.
- 5 Naylor, S., & Keogh, B. (2000). *Concept cartoons in science education*. Sandbach, UK: Millgate House.

## Ngā Kupu

**Hē** - Error, fallacy

**Huritau** - To reflect, consider

**Ohia manomano** - Brainstorm

**Pāhewahewa** - Mistaken, deluded

**Pakiwaituhi** - Cartoon.

**Pōhēhētanga** - Misconception, mistaken belief.

**Whakamārama** - Explanation

From Te Aka Māori Dictionary  
and Paekupu



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