Year 2

Conceptual narrative Science: Changes of matter

In the chemical sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10, properties of matter and changes of matter.

Big ideas

Materials can be mixed with other materials for a new purpose.

What concepts do I want my students to understand?

- Materials can be combined or mixed with other materials. The mixture may have different properties.
- This mixture may be used for a new purpose.

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. It tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts, (properties of matter and changes of matter) together, because they complement each other.

Note: Not all concepts are specifically addressed in each year level.

Introduction

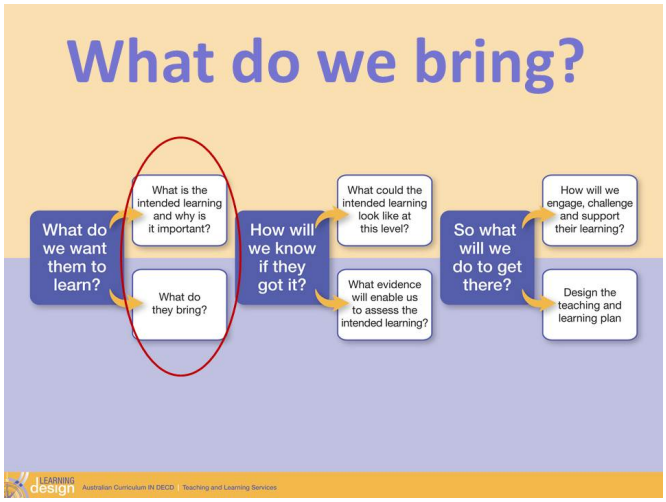
What might my students already know about this concept?

Their world is made up of different materials. These materials can be changed physically in lots of different ways.

What content could I use to explore this concept?

Students could make a variety of mixtures. For example olive oil with water, salt and water and flour and spices.

Now to bring the essence of scientific understanding to life, let's think about this concept through the six questions from the Bringing it to Life tool (BitL).



In Year 2, we want students to understand that materials can be combined and mixed together for a new purpose.

Year 2 example

For this example, I am going to make play dough and plaster of Paris.

What do you notice?

How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you notice?*

In Year 2, I want my students to observe patterns of change when materials are mixed.

- *What happens when flour and salt are mixed? How is this different when water is added?*
- *How is mixing plaster of Paris and water the same? How is mixing plaster of Paris and water different?*
- *How are mixtures different after one hour?*

What do you think?

Students' curiosity leads them to ask questions. These questions help students to order their findings into a pattern to be able to make comparisons or find relationships. These questions support students to be more precise and foster analysis and classification of the observations.

Using the BitL questions, I could ask:

- *What do you think?*

In Year 2, I want my students to ask questions, and look for patterns in the mixtures they are making. Questions I might ask my students are:

- *What is happening?*
- *What else is it like?*
- *What questions do you have?*
- *What is the same in making play dough and plaster of Paris moulds? What is different?*

What do you think if?

How can I help students to identify and formulate investigable questions?

Students ask testable questions that help them to narrow the focus of the inquiry. These questions provide opportunities for students to make predictions.

Using the BitL questions, I could ask:

- *What do you think if...?*

At Year 2, I want my students to start making predictions. Questions I could prompt my students with are:

- *What do you think would happen if we used different amounts of flour or water?*
- *What do you think would happen if we used oil instead of water?*

How can you explore?

These questions support students to develop science inquiry skills and problem solve.

Using the BitL questions, I could ask:

- *How can you explore?*

At Year 2, I want my students to compare their observations to their predictions about mixing materials.

- *How can you explore how different amounts of water affect the mixtures?*
- *Which mixture will make the best play dough or plaster of Paris?*

How can you share?

How can I help students share their observations and questions?

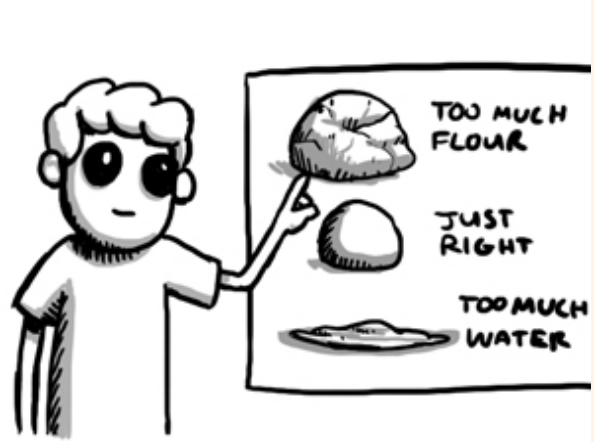
These questions stimulate student's reasoning and help them analyse, draw conclusions and make generalisations about the concepts.

Using the BitL questions, I could ask:

- *How can we share?*

In Year 2, we want students to use counting and informal measurements to compare observations and some students may be able to use provided tables to show patterns. Questions I could ask my students are:

- *Can you draw a diagram, or use the table to show what happens to the mixtures when different amounts of water are used?*
- *Did others find the same as you?*



So what?

How can I help students apply the concepts in a range of authentic contexts?

These questions support students' reasoning, to expand or change their ideas from their experience and evidence, and generalise to new contexts.

Using the BitL questions, I could ask:

- *So what?*

In want my students to see this science in their everyday lives.

- *When do you mix things?*
- *Why do you mix these things?*
- *What are some other things you make by adding flour and water together? Do you need to add other materials also, to make these things?*

Concluding comments

What concepts might students develop through working with the BitL questions in this way?

By exploring this science understanding through these questions, we can help our students to be able to think, work and process scientifically. Students can connect science to their world, and consider why they need to learn that the world is made up of different materials, that can be combined together for a particular purpose.

Appendix 1

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. These concepts develop in depth and breadth of understanding from Foundation to Year 10. This conceptual narrative tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts, (properties of matter and changes of matter) together, because they complement each other.

Note: Not all concepts are specifically addressed in each year level.

Chemical sciences

In the chemical sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10. They are the concepts, properties of matter and change of matter. Let's look at the concept, change of matter.

Let's look at the change of matter concept

Year 1

If you think of the change of matter in Year 1, the focus is that everyday materials can be physically changed in many ways, such as, by bending, stretching or heating. For example, plasticine can be stretched, and an ice cream melts when it is left in the sun.

Year 2

In Year 2, this concept is expanded to understand that materials can be changed when they are mixed with other materials for a new purpose. For example, jelly crystals are changed when they are mixed in water to make jelly.

Year 3

In Year 3, the focus is on changes of state associated with heating and cooling. For example, the change of state from solid chocolate to liquid chocolate when heat is added, or liquid water to solid ice, when heat is removed.

Year 6

When students are in Year 6, they investigate and classify a range of changes as physical or chemical. The first type of change is reversible, where you can get back what you started with. For example, when ice melts to become water, the change can be reversed, by freezing. The second type of change is irreversible. With this type of change, you cannot get back the materials you started with. An example of this is burning paper, where you cannot get paper back from the ash formed.

Year 8

At Year 8 level, we want students to successfully use the terms, elements and compounds. Students make compounds, which can have a number of pure substances or elements joined together through chemical reactions. They learn that new substances are formed, when a chemical reaction occurs. As when iron (an element) reacts with oxygen (another element) in the air, the new compound, iron oxide forms, known as rust and is a new substance, from which the original iron can't be easily recovered.

Year 9

In Year 9, we want students to understand changes in the nucleus of the atom, and how unstable atoms can release alpha and beta particles and gamma radiation. We also want students to understand that chemical reactions involve the rearrangement of atoms to form new substances, and that during a chemical reaction, matter is not created or destroyed. This is known as the Law of Conservation of Mass. For example, the role of oxygen in respiration compared to combustion of butane.

Year 10

Even deeper thinking is required at Year 10. We want the students to be able to understand that there are many different types of chemical reactions which can produce a range of products, and can happen at different rates, depending on the conditions. For example, iron and steel are both produced from iron ore.

So, from Foundation to Year 10, students broaden and deepen their understanding of changes of matter. They start with familiar materials and build on those to consider a wide range of changes and then classify them as physical or chemical. By Year 10, they are able to use particle and atomic theories to explain and classify these changes.