Subject: Science Year5: Properties and changes of materials

NC/PoS:

•know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution

•use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating

•demonstrate that dissolving, mixing and changes of state are reversible changes

Prior Learning (what pupils already know and do)

Objects can be made from one or more materials. Know water, wood, rock and air are natural materials. Know that a solid material is firm and stable in shape. know that a liquid material is a substance that flows freely but is a constant volume. know that a gas is a substance which will expand freely to fill the whole of a container. Know that a solid material can change its state into a liquid when heated, this is melting. Know that a liquid can change its state into a gas when heated, this is evaporation. Know that a gas can change its state into a liquid when cooled, this is condensation. Know that a liquid can change its state into a solid when cooled, this is freezing. Know water evaporates faster if the temperature is higher.

End goals (what children MUST know and remember)

- Know soluble materials dissolve in water
- Know if a material does not dissolve, it is insoluble
- Know dissolving a solid in water makes a solution
- Know there are three ways to separate mixtures: sieving, filtering, and evaporation
- Know sieving is when you pass a mixture of solids of varied sizes through mesh
- Know filtering is when you pass a mixture of a solid and liquid through a mesh
- Know evaporation separates soluble solids from water; the water evaporates and leaves the solid behind
- Know in a reversible change a material turns into something that looks and feels different but is not changed forever – it can be changed back
- Know all changes of state are reversible
- Know mixing and dissolving are reversible changes

Key Vocabulary: matter, natural, filtering, sieving, evaporation, condensation, freezing, melting, dissolving, solute, solvent, solution, soluble, insoluble, reversible, irreversible, formation

Session 1: Review prior learning

Before starting this unit, check children can recall their learning about solids, liquids and gases from the unit *Science, Year 4, States of matter*:

- Define and identify a material.
- The properties of solids, liquids and gases.
- Name the changes of state (evaporating, condensing, melting and freezing).

LO: To describe mixtures

Use resources from Kapow Lesson 1: Mixtures

Use the *Attention Grabber* to explain what a mixture is and move on to the 'Making Mixtures' activity within the *Main Event* section.

Take pictures and record in your Science Floorbook. As a class, answer the following questions:

How many substances are in a mixture?

How can you identify a mixture?
Can all mixtures be easily identified by their appearance?
What state are the substances in a mixture?
Do the properties of the substances in a mixture change when they are mixed together?

Children record individually the definition of a mixture and give an example of a mixture they have made during the lesson using the correct scientific vocabulary.

Vocabulary: mixture, substance, properties

Session 2:

Use resources from Kapow Lesson 2: Sieving

Recap and recall: Children sort mixtures under headings (Table in Floorbook)

LO: To explain the process of sieving

Working Scientifically LO: To draw and annotate a diagram to explain a concept

Use the *Attention Grabber* to establish that a solid-solid mixture can be separated by sieving.

Move on to the *Main Event* activity where the children separate gold glitter/beads and soil (pretending to be prospectors collecting gold). Children use a colander, then a sieve, to see to see how sieving can be used to separate mixtures of solids with different-sized particles.

Take pictures for the floorbook.

Children record individually drawing and annotating their own diagram explaining how sieving can be used to separate mixtures of solids with different-sized particles.

Vocabulary: sieving, mixture, separation, substance

Session 3: Recap and recall: children explain the process of sieving

LO: To explain the process of filtering

Play the link: NASA water filter

Children complete the 'Making a water filter' activity. Explain the similarities between sieving and filtering. (Sieving separates solids of different sizes using varying hole sizes; filtering separates liquids and solids using gaps of different sizes.)

Children make their water filter and draw a labelled diagram in their books.

Vocabulary: sieving, filtering, mixture, separation, evaporation

Session 4: Recap and recall: Children give examples of mixtures that can be separated by sieving and filtering

Use resources from Kapow Lesson 4: Solutions

LO: To describe solutions and how they can be identified

Working Scientifically LO: To make observations about solutions

Teacher to do the 'Disappearing Salt' activity. (Can do the 'Salt solution roleplay if time allows)

Use the 'Making Solutions' activity so the children can create mixtures and identify whether or not they are solutions.

Remind the children that a solution is formed when a substance dissolves in a liquid. Explain that solutions will be clear with no visible particles (note: a solution can be coloured). The mixture is not a solution if it is cloudy or if there are visible particles. Children learn soluble materials dissolve in water and if a material does not dissolve, it is insoluble.

Children record individually the definition of a solution and give an example/s of one they have made.

Vocabulary: soluble, insoluble, solubility, solution, dissolve

Session 5:
Use resources from Kapow Lesson 5: Dissolving
Recap and recall: Use the 'Soluble dyes' activity to recap solutions
Play the *Pupil video: Factors affecting dissolving* and ask the children to make notes.
Children plan an investigation to answer 'How does temperature affect the time taken to dissolve?' Use *Presentation: Planning an investigation* to help the children identify the variables being changed/measured/kept the same
Children record the following individually:
The variable being changed: temperature of the water.
The variable being measured: time taken to dissolve (stop measuring when the sugar is no longer visible).
The variables being controlled: the amount of water, the amount of sugar and the speed of stirring.
Carry out the investigation as a class and record results in Floorbook.
Vocabulary: dissolve, dissolving, solution, soluble, solute, solvent

Session 6:
Use resources from Kapow Lesson 6: Evaporating
Recap and recall: The Water Cycle
LO: To describe the process of evaporation
Children learn in a reversible change a material turns into something that looks and
Use the *Attention Grabber* to elicit responses to establish how salt can be retrieved from a solution.
Do the Main Event activity 'Salt flats' and the children should record their predictions individually in their books, explaining using scientific vocabulary.
Vocabulary: reversible, evaporation, solution, crystallising

Career: Materials engineer
Chemist https://www.youtube.com/watch?v=8tRv0Cs2GR8

Scientists who have helped develop understanding in this field: Spencer Silver https://www.youtube.com/watch?v=ij9bgRRY6x8 and Ruth Benerito https://www.youtube.com/watch?v=UtSdDv-m0E8