

Medium Term Plan: Supporting Implementation of LTP/Progression Grid

Subject: Science Year: 5

NC/PoS:

Properties and changes of materials

- compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- 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
- give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
- demonstrate that dissolving, mixing and changes of state are reversible changes
- explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda

Prior Learning (what pupils already know and do)

- Objects can be made from one or more materials. E.g. School desks are made from wood and metal; pencil from wood and lead
- Know water, wood, rock and air are natural materials
- Know these man made materials: plastic, metal or glass
- Children name a type of material and its properties - **Metal:** Metals are shiny, strong and (usually) hard. They are good conductors of heat and electricity. **Ceramic:** Ceramics are hard and strong but inflexible and brittle. They are good insulators of heat and electricity. **Glass:** Glass is transparent. It is hard but inflexible and brittle. It is a good insulator of heat and electricity. **Plastics:** Plastics can be manufactured to have many different properties. Some can be transparent whilst others can be translucent or opaque. Some are flexible while others can be quite stiff. They are good insulators of heat and electricity.
- Know igneous rocks are basalt, granite, pumice, obsidian and they all contain minerals, can be fine-grained or coarse-grained and often have a glassy texture
- Know sedimentary rocks are chalk, limestone, shale, sandstone and are not crystalline but grainy
- Know metamorphic rocks are slate, marble, quartzite, anthracite and are crystalline
- 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)

To know that heat travels from warmer materials to colder ones

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To know that some materials let heat pass through them easily; these are thermal conductors (metals)
To know some materials do not let heat pass through them; these are called thermal insulators (plastic, cork, wood and fabrics)
To know that thermal insulators are good for keeping heat out as well as in
To know soluble materials dissolve in water
To know if a material doesn't dissolve, it is insoluble
To know dissolving a solid in water makes a solution
To know there are three ways to separate mixtures: sieving, filtering and evaporation
To know sieving is when you pass a mixture of solids of different sizes through mesh
To know filtering is when you pass a mixture of a solid and liquid through a mesh
To know evaporation separates soluble solids from water; the water evaporates and leaves the solid behind
To know in a reversible change a material turns into something that looks and feels different but isn't changed forever – it can be changed back
To know all changes of state are reversible
To know mixing and dissolving are reversible changes
To know in an irreversible change a completely new material is formed and cannot be changed back
To know some things react when you mix them (vinegar and bicarbonate of soda) to make new materials

Key Vocabulary

Matter, natural, filtering, sieving, evaporation, condensation, freezing, melting, dissolving, solute, solvent, solution, soluble, insoluble, decanting, waterproof, absorbent, thermal conductor, insulator, reversible, irreversible, formation

Session 1:

Review prior learning – (revisit properties of materials)
Compare and group every day materials including liquids and gases (water in a balloon, air in a balloon) Show me an item that is a natural material, a conductor of heat etc.
Revisit rocks, states of matter

Session 2:

Lo: Using observation to recognise soluble and insoluble materials

<https://www.youtube.com/watch?v=73Iu9RzZ9tI> soluble vs insoluble Watch up to the first part showing that sugar is insoluble

Give children a variety of materials to test: flour, oil, salt, coffee, vinegar, sand

Vocabulary: soluble, insoluble, solubility

Session 3:

LO: To record and present results linked to dissolving

<https://www.youtube.com/watch?v=k3MhImN8Jmc> dissolving

Children investigate increasing the time taken to dissolve through:

- Number of stirs or time stirring
- Increasing temperature of water
- Changing size of solute

How might I get my solute back? Evaporating the water off.

Model this through putting salt or sugar solution in a warm place to evaporate

Vocabulary: solute, solvent, solution, dissolve, dissolving, evaporate, evaporation

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Session 4:

LO: To record the method for separating a mixture

<https://www.youtube.com/watch?v=JJeY-muIqhw> separation techniques

Children separate a mixture e.g. sand, salt and stones. The children could prepare their own mixture to separate

Vocabulary: sieving, filtering, mixture, separation, evaporation, decanting

Session 5:

Lo: to compare materials and give reasons for their effectiveness

Children to complete the following investigations:

- What other material could be used to filter sand from a sugar solution?
- Different types of cup to keep a drink warm (wood, plastic, ceramic, polystyrene)

Ensure there is a variety of materials for them to choose from

Vocabulary: waterproof, absorbent, thermal conductor, insulator

Session 6:

Lo: to research reversible and irreversible changes

<https://www.youtube.com/watch?v=U6cxHOnEBo4>

<https://www.youtube.com/watch?v=bHIP1IRc0Tg> irreversible reactions

Also show let children explore irreversible reaction:

e.g vinegar and bicarbonate of soda

denture tablet in water

vitamin C tablet etc

Common misconception: burning

The difference between burning and melting. Burning is a chemical reaction in which new products, such as smoke and ash, are produced, whereas melting is a physical change in which a solid turns into a liquid. Burning is irreversible, as it is not possible to turn smoke and ash back into unburned fuel.

To distinguish between smoke and steam. Smoke is a combination of different chemicals that results from an irreversible chemical reaction, whereas steam is a form of water vapour that results from a reversible physical change.

When something burns, part of it vanishes and no longer exists.

Vocabulary: reversible, irreversible, formation

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>