Mendell Primary School

Aspire Challenge Achieve

Medium Term Plan Science

Year Group: 5	Term: Spring 1 continued from Aut 2	Teacher: Miss Keenan	Subject lead: Sarah Bride

Common Misconceptions:

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

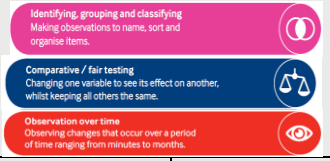
Some children may think:
- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

Unit key Vocabulary:

Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material

Overview: 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.



Key End Points: By the end of this unit children will be able to:

Explain what thermal conductivity is and which materials provide insulation Describe what a solution is Describe what a mixture is Explain the difference between soluble and insoluble. Explain what dissolving means and give examples Explain what filtering and sieving are and give examples Explain how materials can be recovered from solutions or mixtures through evaporation, filtering and sieving. Describe reversible and non-reversible changes including examples. E.g. burning wood, rusting, mixing vinegar and bicarbonate of soda

Links to other learning:

DT, Circuits.

Prior Learning:

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. **(Y2 - Uses of everyday materials)**
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. **(Y2 - Uses of everyday materials)**

Future Learning:

Chemical reactions as the rearrangement of atoms. **(KS3)** · Representing chemical reactions using formulae and using equations. **(KS3)** · Combustion, thermal decomposition, oxidation and displacement reactions. **(KS3)** ·

High Quality Text:

Kensuke's Kingdom – This book is the perfect setting for exploring survival scenarios and is full of opportunities for:
Exploring solids, liquids and gases. Investigating how mixtures might be separated, including through filtering, sieving and evaporating the particular uses of everyday materials, including metals, wood and plastic. Investigating dissolving, mixing and changes of state.

Risk Assessment/Healthy and safety

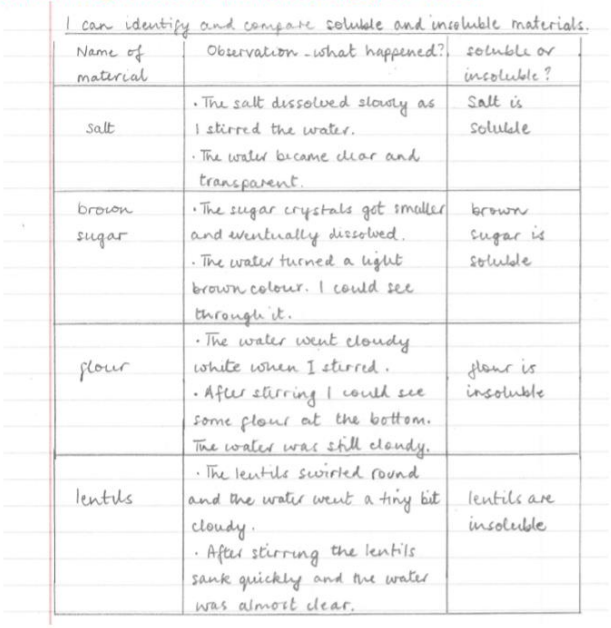
Take care with warm water.

Teacher CPD:

PLAN ASE Diogjena Unit of work.

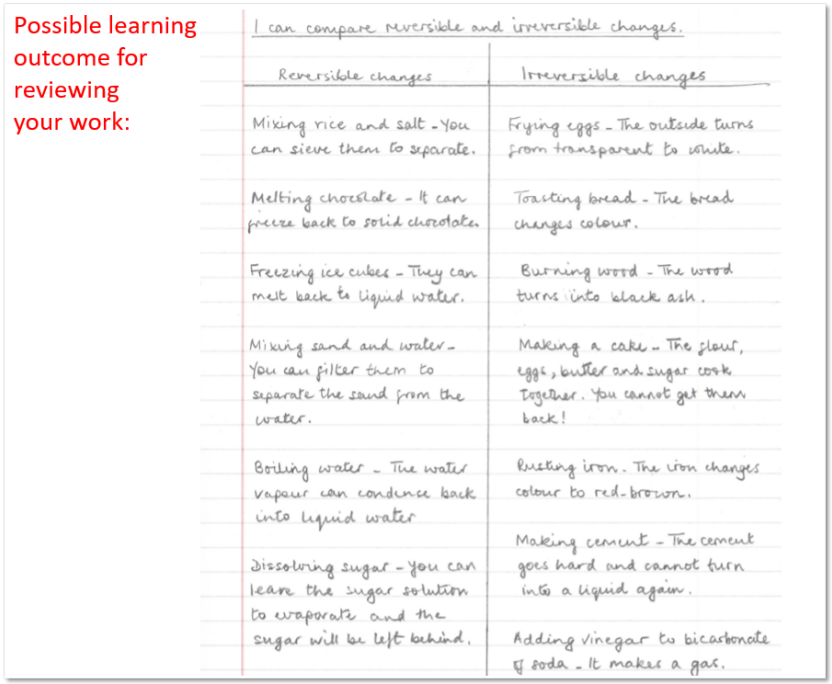
	• Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. **(Y3 - Forces and magnets)** • Compare and group materials together, according to whether they are solids, liquids or gases. **(Y4 - States of matter)** • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). **(Y4 - States of matter)** • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. **(Y4 - States of matter)**	Defining acids and alkalis in terms of neutralisation reactions. **(KS3)** • The pH scale for measuring acidity/alkalinity; and indicators. **(KS3)**	**Scientist to study:** **Antoine Lavoisier (1743 - 1794)** **Dmitri Mendeleyev (1834 - 1907)** **Sir Humphry Davy (1778 - 1829)** **John Dalton (1766 - 1844)** **Marie Curie (1967-1934)**	Remind children that while using liquids in small battery operated circuits is fine, water and mains electricity **DO NOT** mix and would cause an electrical fire/electrocutions.	Reach Out CPD - https://www.reachoutcpd.com/ sign up for free.

	Learning Intention	Lesson Outline (Key Questions in colour)	Resources	Vocabulary	Lowest 20% Adaptations
1	L.I. I can identify and compare soluble and insoluble materials.	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is making predictions and observing.** **Prior learning quiz: What did we find out about materials before Christmas?** Provide children with word cards of key vocabulary explored in previous half term with matching definition – can the children sort them correctly? **Thermal insulator, thermal conductor, electric conductor, electric insulator.** **Explorify: Hot drinks for cold days** - https://explorify.uk/en/activities/odd-one-out/hot-drinks-for-cold-days **Word of the week: soluble** **Big Question: What happens when you add sugar to a warm drink?** Some people like to add sugar to their tea or coffee. **What happens to the sugar?** Get the children to half fill a clear plastic cup or glass with lukewarm water. Add ½ teaspoon of white sugar. Stir slowly and watch what happens. Talk about what they see. Take feedback on what they children observe. Sugar seems to 'disappear' when you stir it into water but it is still there! The sugar has **dissolved** in the water to form a transparent, clear **solution**. Sugar is a **soluble** material. **Which other soluble substances can you find in the kitchen?** Watch this clip: https://www.bbc.co.uk/bitesize/topics/zcvv4wx/articles/zpbdpbk Discuss soluble and insoluble substances using the PowerPoint. Let's compare soluble and insoluble materials we use in the kitchen. Ask the children to follow the instructions on the PowerPoint to test a range of kitchen substances such as brown/white sugar, salt, lentils, rice, flour. Children make predictions before being the investigation. **Recording**; children draw a table to show what happened and weather each material is soluble or insoluble. Example:	ASE PLAN PowerPoint Household items to support learning: Clear plastic cups (or glass cups). Salt, white sugar, brown sugar, flour and rice (or other grain/pulse). Teaspoon and water	**Solution** **Soluble** **Insoluble** **Dissolve** **Transparent**	

		Salt and white sugar both dissolve in water to form a clear, transparent solution. Brown sugar dissolves in water to form a slightly brown coloured solution. All solutions are clear so you can see through them. **Possible learning outcome for reviewing your work:**  I can identify and compare soluble and insoluble materials. Name of material / Observation - what happened? / soluble or insoluble? Salt: • The salt dissolved slowly as I stirred the water. • The water became clear and transparent. — Salt is soluble brown sugar: • The sugar crystals got smaller and eventually dissolved. • The water turned a light brown colour. I could see through it. — brown sugar is soluble flour: • The water went cloudy white when I stirred. • After stirring I could see some flour at the bottom. The water was still cloudy. — flour is insoluble lentils: • The lentils swirled round and the water went a tiny bit cloudy. • After stirring the lentils sank quickly and the water was almost clear. — lentils are insoluble Flour does not dissolve in water. Grains of flour are small, so some will stay suspended in the water, making the water cloudy. The flour grains are called a sediment. Lentils do not dissolve in water. Lentil grains are quite large so they fall quickly to the bottom as a sediment. Dust from the lentils may make the water slightly cloudy.	**Exit pass:** vocabulary and definition matching cards.			
2 & 3	L.I. I can select equipment to separate two or more materials by sieving, filtering and/or evaporating.	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is observing and recording.** *This lesson will need two sessions due to the number of mixtures to separate.* **Prior learning:** **What is the process of evaporation?** **What does dissolve mean?** **What is a soluble material? Can you give an example?** **Word of the week: Insoluble** Sieves and colanders are useful pieces of kitchen equipment. Think or talk about some different ways sieves or colanders are used. **Big Question; How do you separate materials that are mixed together?** Share information about sieves from the PowerPoint and their uses in sifting different materials such as food and soil. Think or talk about when a sieve might not be suitable for separating a solid from a liquid. Watch these two clips: https://www.bbc.co.uk/bitesize/clips/z9jd7ty https://www.bbc.co.uk/bitesize/topics/zcvv4wx/articles/zw7tv9q **How do you separate insoluble and soluble materials from a liquid? – watch:** https://www.bbc.co.uk/bitesize/clips/zb9c87h - ensure children recall prior knowledge of evaporation from Yr 4.	ASE PLAN PowerPoint Kitchen paper, sieve, bowls, cups. Salt, flour and uncooked rice (or other dried grain/pulse). Teaspoon and water.	**Dissolve** **Soluble** **Insoluble** **Sieve/sieving** **Filter/filtering** **Evaporation** **Reversible**	

		Insoluble materials can be separated from a liquid by sieving or filtering. Sieving is suitable for larger-sized objects or grains, such as cooked vegetables or rice. Filtering can separate small grains of an insoluble material from a liquid. For example, a filter separates coffee grains from liquid coffee. Soluble materials can be separated from a liquid by the process of evaporation. Soluble solids like salt dissolve in water to make a clear solution which will pass through a filter. The salt can still be separated because the water can be allowed to evaporate, leaving the salt behind. Insoluble and soluble solids can be separated from a liquid when *no new material has formed*. Mixing and dissolving are reversible changes Provide the children with a range of mixtures to separate – see PowerPoint. Children need to select equipment and method of separation: a. dry sieving only b. filtering only c. sieving and filtering d. filtering and evaporating e. sieving, filtering and evaporating Children to record similar to example below: The kitchen paper acts as a filter. It can take quite a long time for all the salt solution to drip through, leaving the flour behind. The rice and salt can also be separated by dissolving the salt and then sieving or filtering. In this case, the salt solution needs evaporating too. Possible learning outcome for reviewing your work: I can select equipment to separate two or more materials. Mix of solids / Equipment selected / Separating methods / Observations -what happened rice and flour: • sieve • large bowl — • dry sieving — • The rice stayed in the sieve. • The flour went through the sieve into the bowl. • The rice and flour were separated. salt and flour: • kitchen paper • cup • teaspoon • water • plate — • filtering • evaporating — • When water was added and stirred, the salt dissolved. • The flour stayed in the kitchen paper and the salt solution went through. • The water evaporated leaving the salt on the plate. rice and salt: • sieve • large bowl — • dry sieving — • The rice stayed in the sieve. • The salt went through the sieve into the bowl. rice, salt and flour: • sieve • large bowl • kitchen paper • cup • teaspoon • water • plate — • dry sieving then • filtering • evaporating — • The rice stayed in the sieve. • The flour and salt went through the sieve. • When water was added and stirred, the salt dissolved. • Filtering then evaporating separated the salt and flour. Don't worry if you use a method that does not work! Record what happened and then try a different method. It can take a few hours for the water to evaporate and leave the salt behind. Put the plate on a sunny windowsill to help speed up the evaporation. 10			
4	L.I. I can…	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is observing and communicating.**	ASE PLAN PowerPoint	**Reversible** **Irreversible**	

	compare reversible and irreversible changes. recognise that new materials are formed during an irreversible change. 	**Prior learning;** **What happens when we heat or cool materials?** **What reversible changes can you think of?** **How can we separate solutions?** **Word of the Week; Irreversible change.** **How do we change materials?** **Odd one out:** frying eggs, burning bonfire, melting chocolate. **Which one do you think is the odd one out?** Explain your reasons. Children may have selected 'making food' to choose the odd one out. Another way is to compare the type of change taking place. **Can you get the original material back again?** *Watch this clip and think about the changes you see happening.* https://www.bbc.co.uk/bitesize/clips/zc84d2p Cooking an egg and burning a bonfire are irreversible changes. New materials are formed. You cannot reverse the change. Watch this clip about irreversible changes: https://www.bbc.co.uk/bitesize/topics/zcvv4wx/articles/z9brcwx Remind the children about melting chocolate in Year 4 and how this is a reversible change. Melting chocolate is a reversible change. No new material is formed. You can reverse the change by freezing. Think or talk about other reversible changes you have learnt about: -Mixing materials -Dissolving -Evaporation Explore different types of irreversible changes using the PowerPoint and links below; https://www.bbc.co.uk/bitesize/clips/zc89wmn https://www.bbc.co.uk/bitesize/clips/z9wkjxs Provide the children with a range of changes and ask them to sort them into reversible and irreversible changes encouraging them to explain their thinking. Recording example:	Vinegar Bicarbonate of soda A cup and teaspoon	**Dissolve** **Mix** **Melting** **Freezing** **Evaporation** **Condensation**	

		Changes of state are reversible. For example: - Solid chocolate can melt and then freeze again. - Water can freeze and then melt again. - Water can also evaporate or boil and then condense again. Mixing and dissolving are reversible. The materials can be separated by sieving, filtering or evaporating. Possible learning outcome for reviewing your work:  I can compare reversible and irreversible changes. Reversible changes Mixing rice and salt - You can sieve them to separate. Melting chocolate - It can freeze back to solid chocolate. Freezing ice cubes - They can melt back to liquid water. Mixing sand and water - You can filter them to separate the sand from the water. Boiling water - The water vapour can condense back into liquid water Dissolving sugar - you can leave the sugar solution to evaporate and the sugar will be left behind. Irreversible changes Frying eggs - The outside turns from transparent to white. Toasting bread - The bread changes colour. Burning wood - The wood turns into black ash. Making a cake - The flour, eggs, butter and sugar cook together. You cannot get them back! Rusting iron - The iron changes colour to red-brown. Making cement - The cement goes hard and cannot turn into a liquid again. Adding vinegar to bicarbonate of soda - It makes a gas. Irreversible changes can often be recognised by a change of colour. For example, an 'egg white' changes from colourless to white when it is cooked. New materials are formed in an irreversible change. For example, a cake is a new material made from eggs, flour, butter and sugar. Irreversible changes sometimes produce a gas. 9			
5	L.I. I can set up a test to show that some changes result in the formation of new materials, and that this kind of change is not usually reversible	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is observing making predictions and sharing results. .** **Prior learning:** **What is a reversible change?** **What is an irreversible change?** **What changes occur when melting chocolate?** Have the ingredients of various 'bakes' on each table and ask children if they can guess what each makes when mixed together and baked – children move around the room and try to match all of the 'bakes' to their ingredients (use images and lists provided, or you could use real ingredients, and if you like baking, you could bring in real examples to sample!). Check the ingredient matches and ask children if they think they can turn the end product back into the ingredients? No! These are irreversible changes. Split the children into four groups, and explain that they will each be completing a baking investigation and will report back to the rest of the class with their results.	Baked goods ingredients list/images, yeast, sugar, baking powder, vinegar, 1L plastic bottle, balloons, bread and cake ingredients, jelly, eggs & access to cooking facilities, access to the Internet, video recording devices, https://sciencebo	**variables, accuracy, precision, enquiry, new material, not usually reversible, mixing, heating, burning, chemical change, irreversible.**	

		Explain though that children will be approaching the cooking/baking from a scientific slant and will still need to come up with enquiry questions, predictions, record results and present findings. Using the guidance (see resources) discuss the various 'recipe investigations'. Look at each one in turn together and identify enquiry questions by explaining that they need to investigate something that may affect the end product (see examples given). Demonstrate the science of a yeast and sugar reaction (see link for instructions and make sure that you do a control without sugar – this is important for later on!) and repeat with baking powder and vinegar. **Can the children identify that both reactions are giving off a new product in the form of a gas?** Having discussed the science behind the two bakes send children off to complete their baking/cooking challenge. Encourage children to approach their cooking/baking scientifically, using the sticky-note approach (see resources). Help them to predict what will happen and why; and whether it will be reversible or not. Provide children with the guidance and recipes and encourage them to complete independently. Adult support for 'cook an egg' investigation. Get children to write up their investigations, encouraging them to include diagrams of the yeast and baking powder bottle experiments to explain the science behind the cooking. *see additional planning notes in resources.	b.com/blow-up-a-balloon-with-yeast/ - *Blow up a balloon with yeast, Science Bob*		