





# Mendell Primary School

*Aspire Challenge Achieve*

## Medium Term Plan Science



<b>Year Group:</b> 4	<b>Term:</b> Spring 1 continued from Aut 2	<b>Teacher:</b> Miss Jones	<b>Subject lead:</b> Sarah Bride	<b>Overview: States of Matter</b> <ul style="list-style-type: none"> <li>• Compare and group materials together, according to whether they are solids, liquids or gases.</li> <li>• 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).</li> </ul> <div style="background-color: #0056b3; color: white; padding: 2px; font-size: 8px;"> <b>Comparative / fair testing</b>  <small>Changing one variable to see its effect on another, whilst keeping all others the same.</small> </div> <div style="background-color: #00a651; color: white; padding: 2px; font-size: 8px;"> <b>Research</b>  <small>Using secondary sources of information to answer scientific questions.</small> </div> <div style="background-color: #e31a1c; color: white; padding: 2px; font-size: 8px;"> <b>Observation over time</b>  <small>Observing changes that occur over a period of time ranging from minutes to months.</small> </div>	<b>Key End Points: By the end of this unit children will be able to:</b> <ul style="list-style-type: none"> <li>• Describe what happens when liquids evaporate and condenses</li> <li>• Give everyday examples of evaporation and condensation</li> <li>• Describe the water cycle</li> <li>• Talk about temperature being how hot or cold something is</li> <li>• Talk about how we measure temperature</li> <li>• Measure temperature using a variety of thermometers</li> </ul>
<b>Common Misconceptions:</b> 'solid' is another word for hard or opaque <ul style="list-style-type: none"> <li>• solids are hard and cannot break or change shape easily and are often in one piece</li> <li>• substances made of very small particles like sugar or sand cannot be solids</li> <li>• particles in liquids are further apart than in solids and they take up more space</li> <li>• when air is pumped into balloons, they become lighter</li> <li>• water in different forms – steam, water, ice – are all different substances</li> <li>• all liquids boil at the same temperature as water (100 degrees)</li> <li>• melting, as a change of state, is the same as dissolving</li> <li>• steam is visible water vapour (only the condensing water droplets can be seen)</li> <li>• clouds are made of water vapour or steam</li> <li>• the substance on windows etc. is condensation rather than water</li> <li>• the changing states of water (illustrated by the water cycle) are irreversible</li> <li>• evaporating or boiling water makes it vanish</li> <li>• evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.</li> </ul>				<b>Unit key Vocabulary:</b> Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle	<b>Spring 1:</b> <ul style="list-style-type: none"> <li>• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</li> </ul>
<b>Links to other learning:</b>  Geography rivers and water cycle.	<b>Prior Learning:</b> Distinguish between an object and the material from which it is made. <b>(Y1 - Everyday materials)</b> <ul style="list-style-type: none"> <li>• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. <b>(Y1 - Everyday materials)</b></li> <li>• Describe the simple physical properties of a variety of everyday materials. <b>(Y1 - Everyday materials)</b></li> <li>• Compare and group together a variety of everyday materials on the basis of their simple physical properties. <b>(Y1 - Everyday materials)</b></li> <li>• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. <b>(Y2 - Uses of everyday materials)</b></li> </ul>	<b>Future Learning:</b> <ul style="list-style-type: none"> <li>• 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. <b>(Y5 - Properties and changes of materials)</b></li> <li>• Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. <b>(Y5 - Properties and changes of materials)</b></li> <li>• Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. <b>(Y5 - Properties and changes of materials)</b></li> <li>• Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. <b>(Y5 - Properties and changes of materials)</b></li> <li>• Demonstrate that dissolving, mixing and changes of state are reversible changes. <b>(Y5 - Properties and changes of materials)</b></li> </ul>	<b>High Quality Text:</b> Charlie and the Chocolate Factory – Roald Dahl  Itch by Simon Mayor <b>Scientist to study:</b>  Greta Thunberg	<b>Risk Assessment/Healthy and safety</b>  Discuss with children how they should be careful handling warm water.	<b>Teacher CPD:</b>  PLAN ASE Chaya Unit of work.  Reach Out CPD - <a href="https://www.reachoutcpd.com/">https://www.reachoutcpd.com/</a> sign up for free.

	<ul style="list-style-type: none"> <li>Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - <b>Uses of everyday materials</b>)</li> <li>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. (Y5 - <b>Properties and changes of materials</b>)</li> </ul>																												
<u>Learning Intention</u>	<u>Lesson Outline</u> (Key Questions in colour)		<u>Resources</u>	<u>Vocabulary</u>	<u>Lowest 20% Adaptations</u>																								
1	<p>L.I. I can set up a test to explore evaporation</p> <p> <b>Recap:</b> Review what the children recall about the three states of matter, melting and freezing from last half term.</p> <p><b>Draw lines to match the description to the correct of matter.</b></p> <table border="1"> <tr> <td>Solid</td> <td>Particles are touching and in ordered rows</td> <td>Solid</td> <td>Particles can slide past each other</td> </tr> <tr> <td>Liquid</td> <td>Particles are far apart from each other</td> <td>Liquid</td> <td>Particles are moving constantly in all directions</td> </tr> <tr> <td>Gas</td> <td>Particles are touching in a random arrangement</td> <td>Gas</td> <td>Particles cannot move but can vibrate</td> </tr> </table> <p> <b>Can children explain what has happened to the water?</b> It becomes a gas. <b>What do they think causes the drying?</b> (Wind, heat.) This process is called <u>evaporation</u>. <b>Can children name any other everyday examples?</b> Washing drying on a line, water boiling in a saucepan, kettle boiling, puddles.</p> <p>What is happening in these pictures?</p> <div style="display: flex; align-items: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Think or talk about what you see when you heat water in a pan.</p> <p><b>What do you think is in the bubbles at the bottom of the water in this kettle?</b></p> <p>When liquid water is heated it turns into a gas called <b>water vapour</b>. Water vapour is invisible, but it often <b>condenses</b> in the cool air above a kettle or cup of tea, forming tiny droplets of <b>steam</b>.</p> <p>In boiling water you can see bubbles of water vapour forming in the liquid</p> </div>	Solid	Particles are touching and in ordered rows	Solid	Particles can slide past each other	Liquid	Particles are far apart from each other	Liquid	Particles are moving constantly in all directions	Gas	Particles are touching in a random arrangement	Gas	Particles cannot move but can vibrate	<p><b>Draw lines to match the description to the correct of matter.</b></p> <table border="1"> <tr> <td>Solid</td> <td>Particles are touching and in ordered rows</td> <td>Solid</td> <td>Particles can slide past each other</td> </tr> <tr> <td>Liquid</td> <td>Particles are far apart from each other</td> <td>Liquid</td> <td>Particles are moving constantly in all directions</td> </tr> <tr> <td>Gas</td> <td>Particles are touching in a random arrangement</td> <td>Gas</td> <td>Particles cannot move but can vibrate</td> </tr> </table>	Solid	Particles are touching and in ordered rows	Solid	Particles can slide past each other	Liquid	Particles are far apart from each other	Liquid	Particles are moving constantly in all directions	Gas	Particles are touching in a random arrangement	Gas	Particles cannot move but can vibrate	<p><a href="http://www.bbc.co.uk/education/clips/z684d2p">http://www.bbc.co.uk/education/clips/z684d2p</a> - BBC Bitesize info about fair testing</p> <p>squares of material, Evaporation Experiment recording sheet (resource).</p>	<p><b>Fair test, evaporation, temperature. Boiling</b></p>	
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NB: steam is composed of tiny droplets of water, which can be seen, and then which become invisible water vapour (gas). The water hasn't 'disappeared' but has become a gas. Boiling and evaporation are both changes of state when a liquid changes into a gas.

- Boiling happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid.
- Water boils at 100°C.
- Pure water cannot get hotter than 100°C no matter how fast you boil it.

Evaporation can happen at any temperature. Gas evaporates from the surface of the liquid. **What variables or factors might affect how quickly water evaporates from a puddle or from some clothes on a washing line?**

Explain that children will work in groups to plan and set up an enquiry into the factors that speed up evaporation, e.g. wind, warmth. Use pieces of material to act as washing. Discuss where the 'washing' could be placed around the room, e.g. by open window, by fan, on desk, by radiator.

**What will children measure, how much water has evaporated?** – use descriptive language using the sense of touch. **How often will they take measurements? How will they record the results? What do they think will happen (prediction)? How will they ensure their test is fair?** Children should record their question, the equipment they need, how they will make their test fair and the method they will use before they start.

Use a table to show where the washing was placed, time passed and how dry/wet the material is and then give an explanation as to why – e.g. on radiator, completely dry (after 30mins), Why? – because the heat from the radiator has effected the rate of evaporation.

They record their results as they carry out the enquiry and then discuss their findings before drawing a simple conclusion. A labelled diagram should be drawn similar to the example below to explain evaporation.

Process of evaporation. What happens?

Go to your tables and explain what evaporation is in your books:

Evaporation is the process of a liquid becoming (evaporating) a gas and the water particles expanding which is affected by the heat

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L.I. I can make observations about the process of condensation.



**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 observations**

Chaya: "The drink must be hot as there is steam coming out of the mug."

Teacher: "There is water on the window. Is it raining outside?"

Chaya: "Sometimes you get water on the inside of the window. At home, we get that in the bathroom when you shower."

Teacher observations



At this point, Chaya is not using the words 'water vapour' or 'condensation'.

Working scientifically

Cups, hot water, kettle, ice cubes, cling film.

**Melting, water vapour, condensation, evaporation**


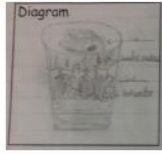
Share the image below with the children and allow them to discuss what they think is happening and what the image is showing. **What do you notice? There is water on the window is it raining outside?**

After the discussion, show the children a kettle boiling and highlight that boiling and evaporating are the same state change, but they happen at different temperatures. Now hold a mirror over the spout of the kettle to show the formation of condensation. Watch:

<https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/zydxmnb>

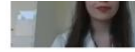
Provide the children with a cup, hot water, cling film and ice cubes. Ask the children to cover the cup of hot water with cling film and place the ice cubes in the top. Ask them what they think will happen – can the children use scientific vocabulary? Ask the children to make observations over time.

**Recording example:**

EVIDENCE OF LEARNING		ASSESSMENT
Examples of work		Knowledge
 	<p>Firstly, we had some hot water in the cup. We covered the cup with cling film. We placed an ice cube on top of the cling film and watched it melt. Since the hot liquid became a gas and evaporated, we watched the ice cube melt. Finally, drops started to appear on the cling film which is now condensed water.</p>	<p>Chaya is beginning to use appropriate scientific vocabulary to describe her observations.</p>
		Working scientifically

Exit pass:

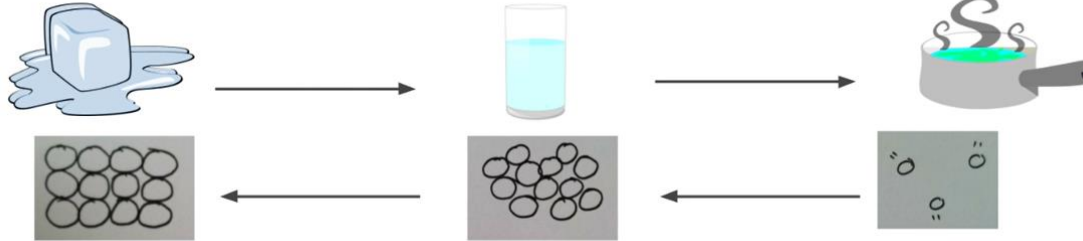
Which state change does each arrow represent?



Solid

Liquid

Gas



3

L.I. I can explore the role of evaporation and condensation within the water cycle.



**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 observations and communicating information.**

**Big question: why does it rain so much in the rainforest?**

**Read the story of a raindrop.**

Ask the children what they already know about the water cycle. Show the children the Water Cycle diagram with no captions or labels – allow the children time to discuss what they think is happening.

<https://www.bbc.co.uk/bitesize/topics/zkqg87h/articles/z3wpp39>

Ensure the children have access to books about the water cycle or iPads for research.

**The Water Cycle explained:** Begin with the rain and discuss with children what happens to the water: falls onto ground (precipitation) and runs off mountains and lower land into streams, which become rivers, which in turn empty into the sea. Some water ends up in lakes and ponds and some infiltrates the ground. Sun and wind cause evaporation and the warm air containing water vapour rises. As the air cools the water vapour condenses into water droplets which form clouds. These clouds get blown by the wind and they precipitate the water again as rain, particularly over higher ground. The cycle begins again.

Set up the water cycle in a plastic bag demonstration. Allow children to observe what happens during the lesson.

Water cycle diagram.

**Streams, rivers, sea, clouds, rain, water vapour, condensation, evaporation, precipitation**



Children draw the Water Cycle and add captions and labels. Make sure that scientific terminology is used. Less able children can draw their own Water Cycle or use a copy of the Water Cycle Diagram from the input, and stick the labels/captions in the correct places.

**Exit Pass:** Look at the concept cartoon and discuss if they agree with the comments the characters are making. If possible, have a jug of iced water on the table and allow the children to pour some into a clean, dry glass. **What can they see? What other examples of condensation can children think of?** Breath that can be seen on a cold day, dew, person wearing spectacles going from cold outside to warm room, etc. **Where does the liquid water come from?** Water vapour (gas) in the air



In a plastic bag

You will need:

- a sealable plastic bag
- a marker pen
- sticky tape
- warm water

1. Draw a diagram of the water cycle on your bag using a marker pen.
2. Pour in a small amount of warm water.
3. Seal the top with tape/zip.
4. Stick it to a sunny window.
5. Observe throughout the day.



You might like to add blue food colouring to the water.

4 L.I. I can write an explanation of the water cycle.



**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 communicating information.**

**Explorify: What if? – What if water didn't evaporate?** - <https://explorify.uk/en/activities/what-if/water-didn-t-evaporate>  
In pairs, discuss what might be a Plus, Minus and Interesting way to think about the question. Stuck for ideas? They could think about:

- Would hot countries have the same amount of water as cold countries?
- Would the playground always be covered in puddles?
- Would it ever rain again

Watch; <https://www.bbc.co.uk/bitesize/clips/z8qtfg8> to review learning from previous lesson.

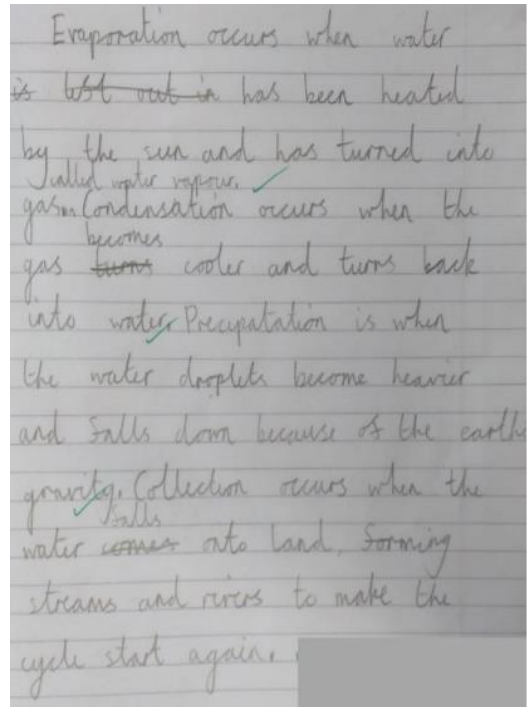
<https://www.youtube.com/watch?v=qrlEHV580Mg> – Water cycle song;  
<http://www.bc.co.uk/education/clips/z8qtfg8> - Class clips - simple explanation of the water cycle;

**Streams, rivers, sea, clouds, rain, water vapour, condensation, evaporation, precipitation, collection.**

Give the children a copy of the water cycle song and highlight the key scientific vocabulary. Can the children write a definition of each part of the process in pairs – condensation, evaporation, precipitation, collection?

**Recording example: Extended writing opportunity:** Ask the children to use everything they now know about states of matter and evaporation and condensation to write an explanation of what happens during the water cycle.

<http://www.metoffice.gov.uk/learning/we-ather-for-kids/water-cycle> -



Evaporation occurs when water is ~~lost~~ ~~out~~ in has been heated by the sun and has turned into ~~gas~~ <sup>called water vapour</sup>. Condensation occurs when the gas ~~turns~~ <sup>becomes</sup> cooler and turns back into water. Precipitation is when the water droplets become heavier and falls down because of the earth's gravity. Collection occurs when the water ~~comes~~ <sup>falls</sup> onto land, forming streams and rivers to make the cycle start again.

The first stage of the water cycle is evaporation. [Due] to the heat of the sun, water in rivers, lakes and seas forms into a gas called water vapour. During this process, the water molecules ~~space~~ separate.

The next stage in the water cycle is condensation, which is when the water vapour gets carried <sup>into the sky</sup> by the wind and forms clouds. Up in the sky, the gas gets cooler and turns into liquid again.

Children may benefit from picture prompts when writing their explanation text.

Now, the water in the clouds (which is now ~~drop~~ water droplets) becomes heavier and falls to the ground, due to the earth's gravity. This stage is called precipitation. The water molecules

The last stage in the water cycle is called collection. This stage occurs when the droplets become settled on the ground. Now, the water on hills and ~~and~~ other types of land forms water springs. Finally, they join together and the cycle starts again.

5 L.I. I can explain the effects of climate change



**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 asking questions, observing and communicating**

**Big Question: What would happen if the climates of the world changed?**

**Word of the week: climate change.**

Allow children time to draw upon their knowledge of melting, freezing, water cycle to consider what might happen or the effects of climate change. Discuss with the children what they already know about climate change and its effects.

Show the children three ice cubes and explain the first represents the worlds current climate – observe over time how long it takes to melt in the classroom. The second ice cube is placed on top of warm water to represent the world's climate with an increased climate in 10 years

Ice cubes, warm water, bowls, stop watch, ipads, climate change data.

**Climate change, melting, temperature, increase, sea levels, water cycle, evaporation, weather.**





time – observe how long it takes to melt. Finally, the third ice cube is placed on top of hot water to represent the worlds increased climate in 50 years time – observe how long it takes to melt.

Ask the children to consider the following questions:

**How would these climate changed effect the water cycle? / weather?**

**How would it effect sea levels? – What impact would this have?**

**How would it effect wildlife?**

Show the children the data collected linked to climate change (see resources) allow them to study them for a short time with their partner and see if they can provided an explanation as to what would happen if things continued the way they are. Take this opportunity to ask pattern seeking questions and assess if the children can interpret the data provided to them. Allow children time to explore the effects of climate change using Ipad.

Share the work of Greta Thunberg and her work with climate change – **how can we stop climate change together?**

**Task:**

Ask the children to create a poster explaining to the other children in school the effect of climate change on the world. Ensure they draw a diagram of the ice cube model to help support their explanations – assess if the children make links to prior learning – water cycle, melting points.

**Extension:** ask the children to include ways of stopping climate change – link with Greta.