No Limits
To Learning!

Topic Title: Wild Weather **Year Group**: 4 **Academic Year**: 2022-2023

Science Intent: How does water change state?

Children will learn about the differences between solids, liquids and gases, classifying objects and identifying their properties. The children will work scientifically and collaboratively to investigate the weight of a gas. They will explore in-depth how water changes state, exploring melting, freezing, condensing and evaporation.

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<tr><td>Prior Scientific Learning/Linked Topics:</td><td colspan="2">Literacy Links (including texts/media used):</td><td colspan="2">Maths Links:</td></tr>
<tr><td rowspan="2">Scientific Knowledge</td><td colspan="4">Working Scientifically</td></tr>
<tr><td>Observing and Measuring over time</td><td>Identifying, classifying and grouping</td><td>Comparative and fair testing (controlled investigations)</td><td>Research</td></tr>
<tr><td>Compare and group materials together, according to whether they are solids, liquids or gases

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)

Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature</td><td>Questioning and enquiry
Planning
Ask relevant questions and use different types of scientific enquiries to answer them.
Raise their own questions about the world around them.
Make some decisions about which types of enquiry will be the best way of answering questions.
Observing + measuring Pattern seeking
Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.</td><td>Identifying, grouping and classifying
Identify differences, similarities or changes related to simple scientific ideas and processes.
Talk about criteria for grouping, sorting and classifying and use simple keys.
Compare and group according to behaviour or properties, based on testing.</td><td>Investigating
Set up simple practical enquiries, comparative and fair tests.
Recognise when a simple fair test is necessary and help to decide how to set it up.
Can think of more than one variable factor.</td><td>Begin to recognise when and how secondary sources might help to answer questions that cannot be answered through practical investigations.</td></tr>
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	Begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them. Help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used. Learn to use new equipment appropriately (eg data loggers). Can see a pattern in my results. Can choose from a selection of equipment. **Recording and reporting findings** Gather, record, classify and present data in a variety of ways to help in answering questions. Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. Use notes, simple tables and standard units and help to decide how to record and analyse their data. Can record results in tables and bar charts. **Conclusions** Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.			

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	Use straightforward scientific evidence to answer questions or to support their findings. With help, look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. With support, identify new questions arising from the data, make new predictions and find ways of improving what they have already done.			

Content:

Lesson 1: To compare and group materials together according to whether they are solids or liquids.

Show children the pictures of solids on the slides. How could you sort these objects into groups? Then show children the next set of pictures. How could you sort these objects into two different groups? Explain that one way we could have separated the objects was into solids and liquids. What do these terms mean? Create a definition for each as a class. How can we tell if an object is a solid or a liquid? What is the difference between solids and liquids? Invite children to share their ideas then go through the list of ideas on the slides. Explain that one way of checking to see if an object is a liquid is to see if it will pour. You can pour e.g. milk, water, orange juice from a bottle into a glass. You cannot pour solid objects like a chair or a mug. However, what about a bag of rice? What about a bag of flour or a bag of sand? Demonstrate. You can pour these but does that mean they are liquids? Explain that they are solids that have very small particles which allows them to pour but you cannot e.g. pour one single grain of rice or a single grain of sand. These keep their shape just like other solids. In small groups, provide children with a variety of solids and liquids to investigate. Include objects with varying viscosity, such as cotton wool, sand, tights, etc. Children to explore the items and decide whether they are solid or liquid. On a sticky label, children to write reasons for how they knew each object was a solid or a liquid, e.g. "I know this is a solid because it doesn't change shape and it cannot be poured" or "I know this is a liquid because when I tilt the container the liquid stays level and it can be poured". • Children to lay each item on the table as a group and label each one. • When all groups have finished, children from one group swap with another to have a look at their labels. Do you agree with their decisions and the reasons they have described? Why? Why not? Invite children to share their ideas. **- Identifying grouping and classifying - Interpreting and communicating results**

Lesson 2: To identify and explore the properties of gases.

What is air? Give children some time to discuss their ideas as a class. Explain that air is not 'nothing'. Air has weight and is all around us. Show children the picture of the hang glider. Explain that air resistance keeps the hang glider in the air. If air was nothing, the hang glider wouldn't be able to float. What are the differences between a solid, liquid and a gas? Children to think, pair, share their ideas. What would happen to these solids, liquids and gases if we poured them into these beakers? Go through

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the slides explaining that the solid would stay the same shape, the liquid would take the shape of the new container and the gas would spread out in the container and continue spreading into the air. Go through the explanations of the differences in particles in solids, liquids and gases. Use this information to help children predict what would happen to the syringes filled with sand, water and air. Show children the sentences on the board and ask them to match the statements to either solid, liquid or gas. Check the correct answers on the slides. Provide children with two balloons, a coat hanger and two equal pieces of string. Children to attach deflated balloons to either side of the hanger, like a balance. Children should note that they are an even weight. After blowing up one balloon, children should note that the blown up balloon weighs more than the deflated balloon. Children to draw a diagram and answer questions **Identifying grouping and classifying - Interpreting and communicating results**

Lesson 3: To observe that materials change state when they are heated or cooled. Carousel of melting and heating materials – chocolate over hot water, bread in a toaster, candle burning – Risk assessment to be written. Show children the pictures of water, ice and steam on the slides. These pictures all show water but can you describe what has happened to each one? Children to think, pair, share their ideas. Explain that lots of materials can exist both as solids and liquids depending on the temperature. When water freezes it turns into solid ice. When it warms up again it changes back to a liquid. Can you think of any other materials that can melt and solidify again? Children to think, pair, share their ideas. If children are stuck for ideas, give examples such as butter, candle wax, chocolate, ice cream, etc. Do all these materials we have thought of melt at the same temperature? Do you think these objects would melt? Show children the picture of a rock and a metal jug. Explain that metal melts at very high temperatures. Go through the chart explaining the melting temperatures of different metals. Melting metals is how metal objects are shaped. The molten metal is poured into moulds to make it the correct shape and as it cools down it turns into a solid again. Go through the information on volcanoes and molten rock. Do all materials melt at the same temperature? Tell children that today they will be investigating this question. Show children the different objects you will be testing (e.g. ice cubes, butter, chocolate, ice cream and a candle). Which of these do you think will melt at room temperature? NB: keep ice cream and ice cubes in the freezer/cool bag until children have completed the planning stage of the experiment. Children to plan their experiment on worksheet . When finished, place all the items in the same spot in the classroom and leave for specified amount of time, e.g. one hour, then look at the objects as a class. Which have melted? Which are still solid? Children to record what they can see on the worksheet. What did we find out from this experiment? Children to discuss ideas then complete the conclusion **Research – Asking Questions**

Lesson 4: **How to use a thermometer** – marking temperatures on thermometers and reading temperatures from thermometer drawings. **Observation over time – Observing and Measuring**

Lesson 5: **To research the temperature in degrees Celsius (°C) at which materials change state.**
What is temperature? Children to think, pair, share their ideas then write a definition on the slides. How can we measure temperature? What units of measurement can we use? Invite children to share their ideas. Go through the information on the slides about temperature and how it is measured. What is it called when liquid water is turned into a solid? What temperature does this happens at? Explain that when water freezes or solidifies it turns from a liquid to a solid. The freezing or solidifying temperature of water is 0 oC. When ice heats up it starts to melt. How long do you think it would take this bowl of ice to melt in this classroom? What if the room was 10 oC hotter or 10 oC colder? What if there was just one ice cube instead of a bowlful? Invite children to share their ideas. Explain that other solids also melt when heated. Do you know how plastic toys are formed? Show slides explaining the process of plastic injection moulding. Some materials have surprising melting points! Show slide describing the metal

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Gallium. Explain that children will now use a variety of sources of information to record and present findings about the changing states of a range of materials. Give each group of children a set of Materials Fact Cards to look at. On worksheet 4A, children are to use this information to draw the missing bars on a partially completed bar chart. They can then use this and the cards to help them answer questions about the materials. **Observation over time – Observing and Measuring**

Lesson 6 and 7: **To understand the process of evaporation.**

Pour some perfume or after-shave into a shallow dish and place it at the front of the classroom. Ask children to put their hands up when they can smell it. • Why can you smell the liquid from where you are sitting? Children to think, pair, share their ideas. Explain that we smell things when gases enter our noses. Some of the liquid from the perfume evaporated and turned into a gas which then travelled around the classroom since gases flow easily from place to place, unlike liquids and solids. This is why you were able to smell it. • What happens to puddles outside when it stops raining or when wet clothes are hung outside to dry? Invite children to share ideas. Explain that when water and other liquids are heated they evaporate and turn into a gas. Although it looks like the liquid has disappeared, it is still in the air but as a gas. Explain that this is how we get rain. The water on the ground heats up again and evaporates. The water vapour in the air then cools down, forms clouds, which then drop the liquid water back to the ground. This is called the water cycle. Can you think of any other examples of evaporation? Children to think, pair, share their ideas then list on the slides. children to draw a diagram and write a description of three different examples of evaporation (e.g. puddles, wet washing, perfume, water drying on a washed car, water boiling on a stove). Encourage children to use scientific language in their descriptions Set up two beakers of water in the classroom and mark where the water level comes to (or measure out a specific amount of water e.g. 300ml) for each one. Leave one in a warm place e.g. next to/above a radiator and one in a cooler place. What do you think will happen to this water if we just leave it? Invite children to share their ideas. Children to plan the experiment on worksheet 5C, stating how they will make it a fair test (same amount of water in each, same surface areas, etc.) and what they predict will happen. Every day, measure how much water has evaporated until each beaker of water has evaporated completely. Children to mark the results on the worksheet every day. What happened to the water? Did both samples evaporate at the same rate? If not, why do you think this was? Children to discuss ideas and then write a conclusion on the worksheet. **Observation over time – Observing and Measuring**

Lesson 8: To understand the process of condensation.

If evaporation is when a liquid turns into a gas, what do you think condensation might be? Invite children to share their ideas. Explain that condensation is the reverse of evaporation and occurs when a gas cools down and turns into a liquid. Show children the picture of condensation on a window. Can you think of any other examples where you might see condensation? Children to think, pair, share their ideas then list on the slides. Go through the examples on the slides. Make sure children understand that condensation occurs more on cold days than warm days. A window, for example, will be much cooler than the warm air inside so when the water vapour hits the window it will cool and turn into liquid. Show children a picture of a can of drink that has come out of the fridge with condensation on it and ask them to explain how it got there to check their understanding. Take out the cans of drink from the freezer and ask children to watch what happens. Can you see the condensation? Children to draw an annotated diagram and then write a description of what condensation is and when it occurs. **Observation over time – Recording Data**

Lesson 9: To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

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What do the words ‘evaporate’ and ‘condense’ mean? Recap with the class. Where does the water from a tap come from? Children to think, pair, share their ideas. Go through the information on the slides explaining what the water cycle is. Look at the diagram of the water cycle on the slides. As a class, fill in the labels for each of the different processes to check that children understand how water evaporates and condenses. children to fill in the labels on the diagram of the water cycle. When finished, challenge children to use the diagram to describe to a partner how the water cycle works. **Research - Recording Data**

Stunning Start/Marvellous Middle/Fabulous Finish:	**OAA/Trips/Visits/Visitors:**
To be revealed	Lookout centre? tbc