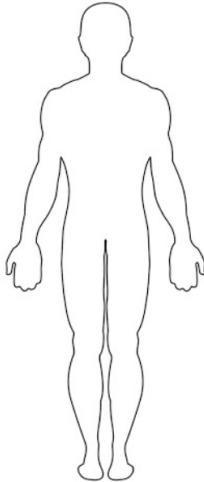


WATER IS LIFE (LEVEL 3)

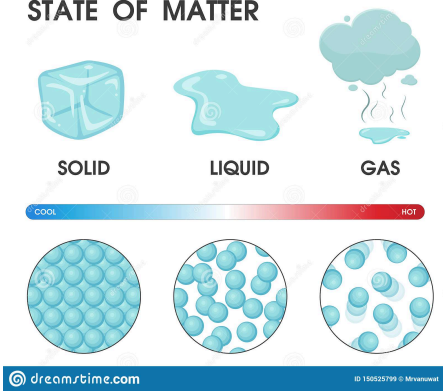
Description	Explore the different uses and sources of water and understand the importance of clean water for living things.
Leading Question	How can we become more mindful of how we use water?
Total Time Required	4.75 hours over 4 days
Subjects	Science, Maths
Supplies Required	Paper, pencil, pen or color pens, ruler (optional), two cups, sand, pebbles, water, bowl, string, marker (optional), teabag, spray bottle (containing perfume, air freshener etc.), salt
Learning Outcomes	<ol style="list-style-type: none"> 1. Understanding of the importance of water for living things 2. Understanding of the three states of matter as it relates to the interaction between water and heat 3. Understanding of the need to save water and steps toward that end 4. Understanding of the water and carbon cycle 5. Understanding of pollution 6. Converting percentages into fractions 7. Calculating the area of a circle 8. Visualizing fractions 9. Data handling - creating and interpreting bar graphs and pie charts
Previous Learning	<ul style="list-style-type: none"> ● Fractions and percentage ● Division ● Sentence level reading and writing
Topics/Concepts Covered	<ul style="list-style-type: none"> ● Environmental Studies ● Importance of Water ● Water bodies and Sources of water ● Water consumption and conservation ● Water cycle and water pollution ● Fractions and percentage

DAY 1

Today you will find out the different ways we use water!

Suggested Duration	Activity and Description
30 minutes	<ul style="list-style-type: none"> ● What happens when you don't drink water for a long time? Can you imagine not drinking water for days or weeks? ● Conduct an experiment to show what happens when something loses water: <ul style="list-style-type: none"> ○ Place a piece of fruit, vegetable, bread, or cooked rice out in the sun and come back to it at the end of the day or in 2 days to see how it changed. What do you think happened? ● Almost every living thing contains water and that the object placed in the sun became dry and hard because the heat of the sun caused it to lose water. The loss of water from an object due to heat exposure is called evaporation. ● Draw a before and after image of the object to show changes. <p>All living things need water to survive. This means that humans, animals and plants cannot live without water. Most of the human body is actually made up of water. Human blood is made up of liquid and solid parts - over 90% of the liquid part (called plasma) is made up of water!</p> <div style="text-align: center;">  </div> <p>The human body is 60% water. Do this activity to illustrate this:</p> <ul style="list-style-type: none"> ● Express 60% as a fraction (hint: simplify 60/100 to get the answer) ● Draw a human body silhouette as shown above and show that 60% of it is water using a color pen or pencil. You can do this by expressing the 60% as a fraction then dividing the silhouette into the number of parts indicated in the denominator of the fraction. Next, color the number of parts indicated in the numerator to show 60%.

	<ul style="list-style-type: none"> ● Draw a rectangle, square or other shape to represent the human body. Calculate the area of this shape using a ruler (e.g., length x width gives you the area of a rectangle, side x side gives the area of a square, and πr^2 gives the area of a circle). Calculate 60% of the result and demonstrate that in your shape by shading or coloring the part that is 60% water. <p>Note: if you do not have a ruler, you can use an object of a known length/size or you can use alternative measures such as the distance between your index and thumb as a unit. You can also simply draw a shape and give it approximate dimensions based on your best guess.</p>
10 minutes	<ul style="list-style-type: none"> ● Think about some ways water is used and draw labeled images showing how water is used in different contexts - in the home, in industries/factories, in nature etc.
20 minutes	<p>Revisit the three states of matter - solid, liquid, and gaseous:</p> <ul style="list-style-type: none"> ● What does water look like in the three states? ● Boil water to get steam or water vapor, which is the gaseous form of water. ● Water we consume and that which is in water bodies exists in its liquid state. ● Water turns into ice when frozen and we see this also in nature in cold places (icebergs permafrost etc.) ● Adding or removing heat causes water to change states - boiling vs freezing have different effects on water.
5 minutes	<p>The particles of water are of different density in its three states.</p> <ul style="list-style-type: none"> ● In which state do you think the particles are loosely arranged and can move freely? ● In which state are they tightly packed and cannot move? ● Draw three diagrams showing how water particles look in all three states (hint: think of which state water moves most freely in. In this state, the particles can be drawn as small balls that are far away from each other). <p>Answer: water particles are compact in its solid form (ice) with high density (how crowded the particles are). In its liquid form, water particles are less dense than solid, but more dense than gas. Density makes something light or heavy.</p>

	<p>STATE OF MATTER</p>  <p>Source: https://www.dreamstime.com/changing-state-matter-solid-liquid-gas-due-to-temperature-vector-illustration-image150525799</p>
<p>20 minutes</p>	<ul style="list-style-type: none"> • Numeracy activity: <ul style="list-style-type: none"> - The earth is 71% water. Draw a circle representing the earth and using a ruler, find its area using the formula πr^2. Find out the area covered in water – calculate 71% of the area of your earth figure. - Color or shade 71% of the earth figure you drew to show how much water covers the earth. - Express 71% as a fraction.

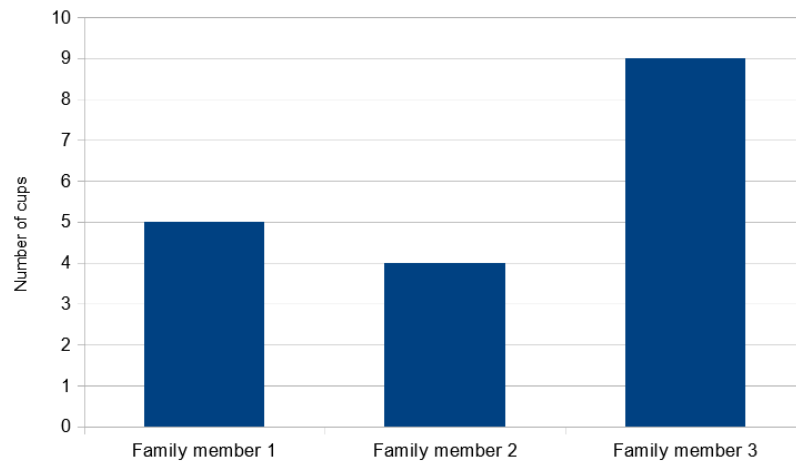
DAY 2

Today you will continue to explore your household water consumption and learn about the water and carbon cycles.

Suggested Duration	Activity and Description		
<p>30 minutes</p>	<ul style="list-style-type: none"> • Find out how much water is being consumed by her or his household daily. Create the following table to track daily water consumption by writing down how many glasses of water each member of the family drinks in a day. Ask each family member or observe their water consumption throughout the day or week. <table border="1" data-bbox="462 1675 1144 1755"> <tr> <td data-bbox="462 1675 755 1755">Name</td> <td data-bbox="755 1675 1144 1755">Number of glasses on Sunday</td> </tr> </table>	Name	Number of glasses on Sunday
Name	Number of glasses on Sunday		

Family member 1	5
Family member 2	4
Family member 3	9

- Represent this in a bar graph:



- Draw a pie diagram showing the percentage of water consumed by each member:
 - Calculate total water consumption.
 - Find the percentage of each member's water consumption.
 - Represent each family member's water consumption in a pie diagram showing each member's percentage.
- Write a report on your findings answering the following questions:
 - Who drinks the least amount of water? (percentage)
 - Who drinks the most amount of water? (percentage)
 - How many glasses of water do all family members drink in total?
 - What day was water consumption the highest vs lowest?
 - Does drinking more or less water have an impact on health? Ask family members about health problems or experiences after not drinking enough water and write about this in your report.

Present the research process and research report to the family members.

The family members will give feedback on what they loved about the presentation and suggested areas of improvement.

Use the feedback to revise the report.

<p>5 minutes</p>	<ul style="list-style-type: none"> ● Brush up on the water cycle. If needed, check your understanding of the process: <ul style="list-style-type: none"> - Just like the sun dried up the object we placed outside from our day 1 experiment, the sun causes water from water bodies like the sea to evaporate. What happens when we boil water? Do you see the steam going up? This is what happens when water from water bodies evaporates, it goes up as water vapor or steam. - When water vapor goes up, it starts to cool down because the higher we go, the colder the temperature gets. When they cool down, they form clouds! Clouds are made of cooled down water vapor that is floating in the atmosphere. This cooling down of water vapor is called condensation. - When too many of these water vapor clouds are created in the sky, they become too heavy and fall down as rain! This is called precipitation.
<p>10 minutes</p>	<ul style="list-style-type: none"> ● Based on the recap above, draw a labeled diagram explaining the water cycle (including evaporation, condensation and precipitation) in different settings (e.g. rainforest, desert, etc.) ● After they complete the diagram, they can refer to the appendix to check the accuracy of their figure. ● The learner will share the labeled diagrams for the water cycle in different settings with family members for feedback. The learner will use the feedback to revise the water cycle diagrams where necessary.
<p>15 minutes</p>	<ul style="list-style-type: none"> ● Explore the role of carbon and diffusion in nature. There is another cycle of carbon dioxide in nature and it interacts with the water cycle in different ways. Carbon dioxide makes earth's climate warmer, which leads to more evaporation. Carbon dioxide diffuses into water bodies and air. Diffusion is the movement of particles in liquids and gases from areas of high concentration to areas of lower concentration. Gas and liquid particles move more freely than those of solid objects, which allows for diffusion to take place. The learner will do the following experiments to observe diffusion: <ul style="list-style-type: none"> - Place a teabag (highly concentrated with tea particles) in a cup of boiling water (no concentration of tea). - Spray a perfume or air freshener in the air. - What do you observe? The particles from the original source mix with the particles of the receiving object and slowly spread throughout the secondary medium. The concentration of tea and perfume in the second object (cup of hot water or air) is lower than the concentration of the items in the original sources.

	<ul style="list-style-type: none"> - This is what happens with carbon dioxide in water and air. - What other items can you do these experiments with? Can you do it with a liquid and solid or gas and solid?
10 minutes	<ul style="list-style-type: none"> ● Write down your observations about diffusion in different states of matter. ● Note: if you are comfortable with the water cycle, you can explore the carbon cycle and the interaction between the two cycles further. Please refer to the 'additional enrichment activities' section at the bottom of this page.

DAY 3

Today you will explore the water pollution.

Suggested Duration	Activity and Description
30 minutes	<ul style="list-style-type: none"> - Answer these questions <ul style="list-style-type: none"> o Do you think the water we have on earth will last forever? o Why or why not? o Is it important to change the way we use water? - If we don't save water, we will not have enough of it and that although 71% of the Earth is covered in water, not all of it can be used for drinking because a lot of it is salty seawater or dirty or polluted water. - Discuss how pollution from human activity makes water bodies like rivers, seas, and lakes, dirty and show it is important to make sure that water is saved and kept clean. <p>Do an experiment to learn about clean water:</p> <ul style="list-style-type: none"> - Fill a cup with water then find objects to put inside the cup to "pollute" the water. The learner can also make "beach water" by adding dirt/sand and small rocks. Note: do not use clean water for this experiment. Use water that was already used to wash dishes or clothes so that you do not waste clean water. - Examine the cup. Ask the learner if she or he can drink it? What would happen if you drank it? Explain that dirty water can make us sick and that it is important to drink clean water. <p>You will now try to get clean water:</p>

	<ul style="list-style-type: none"> - Bring an empty cup. Stir the cup with dirty water and notice how the dirt settles to the bottom. The learner will allow all the dirt to settle for a few minutes then transfer the water from the dirty cup to the clean cup. - Try a different method of water purification. Pour the water back into the dirty cup and place a piece of light cloth (like nylon stockings) on top of the other empty cup. Now, pour the dirty water into the empty cup and watch it pass through the cloth filter to become clean. - Reflect on which method worked best and write her or his observations about the experiment down. 															
<p>20 minutes</p>	<ul style="list-style-type: none"> ● Try to come up with a solution to address water pollution. ● First think of some causes or sources of water pollution from human activity (that are the results of activities carried out by individuals, companies, governments, etc.). ● Next, think of the effect of this pollution on humans, animals, and the Earth. ● Then, create and fill out the following table in his or her notebook or paper and list his or her recommended solutions for each. <table border="1" data-bbox="464 993 1398 1545"> <thead> <tr> <th>Source of pollution</th> <th>Effect</th> <th>Potential solution</th> </tr> </thead> <tbody> <tr> <td>● e.g., industrial waste dumped in water bodies</td> <td>● e.g., polluted drinking water source, which causes waterborne diseases in humans</td> <td>● e.g., alternative waste disposal system</td> </tr> <tr> <td><insert source></td> <td><insert effect></td> <td><insert solution></td> </tr> <tr> <td><insert source></td> <td><insert effect></td> <td><insert solution></td> </tr> <tr> <td><insert source></td> <td><insert effect></td> <td><insert solution></td> </tr> </tbody> </table> <p>Make a presentation to the family members about water pollution. The presentation should cover causes, effects and solutions to water pollution and receive feedback.</p> <p>Family feedback will include:</p> <ul style="list-style-type: none"> ● What did they love about the presentation? 	Source of pollution	Effect	Potential solution	● e.g., industrial waste dumped in water bodies	● e.g., polluted drinking water source, which causes waterborne diseases in humans	● e.g., alternative waste disposal system	<insert source>	<insert effect>	<insert solution>	<insert source>	<insert effect>	<insert solution>	<insert source>	<insert effect>	<insert solution>
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<insert source>	<insert effect>	<insert solution>														
<insert source>	<insert effect>	<insert solution>														

	<ul style="list-style-type: none"> • What could be improved? • Any other suggestions for what could be added <p>Use the feedback to revise their presentation</p>
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DAY 4

Today you will explore water conservation.

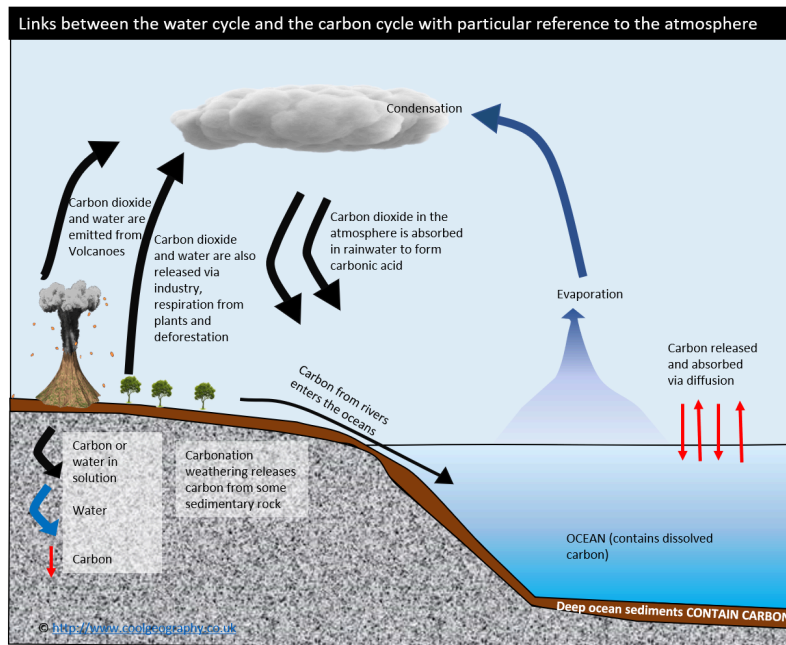
Suggested Duration	Activity and Description
20 minutes	<ul style="list-style-type: none"> • Reflect on why we need to save water. Explain that, in addition to pollution, water is also scarce. As discussed on day 3, most of the water on Earth cannot be consumed. Do an experiment to demonstrate this: <ul style="list-style-type: none"> - Collect some seawater from a nearby water body or add three tablespoons of salt to a cup of water - Boil the saltwater until all the water evaporates - What do you observe? You will find that after all the water evaporates, you are left with salt! This is one of the ways salt is made. If you are unable to do this experiment, simply ask the learner what he or she thinks will happen given that seawater contains both salt and water, and that we know that heat exposure through boiling will make water evaporate - what will be left behind? - What do you think will happen to your body if you drink seawater? Keep in mind that water evaporates from humans in the form of sweat and leaves the body also in the form of urine. If humans drank only seawater, we would have more salt in our bodies than water and would not be able to survive due to dehydration!
10 minutes	<ul style="list-style-type: none"> • Reflect on different ways water is used that might be wasteful or unnecessary. These are some prompts to help: <ul style="list-style-type: none"> - Do you think we need to keep the tap on while we brush our teeth? - Do you think it is OK to throw away water bottles that still have some water in them? - How do you think we can use less water in washing, showering, cleaning etc.? (Examples: keep taps turned off when you are not using them, take quick showers that are less than 5 minutes etc.) <p>Ask family members to provide other activities that waste water.</p>

10 minutes	<ul style="list-style-type: none"> • After reflecting on the different water wasting activities, come up with a few steps your family can take to save water. You can illustrate and write down some steps everyone in your household can take to save water.
30 minutes	<p>Present to the family members the different steps your families can take to save water for feedback and to agree with family members on what needs to be done to reduce wastage.</p> <ul style="list-style-type: none"> • Think about steps to reduce pollution (such as using glass bottles instead of water bottles, not littering beaches, etc.). You can ask family members for suggestions. • Design a poster containing: <ul style="list-style-type: none"> - 5 steps to reduce water use or water wastage. - 5 steps to reduce water pollution. • The steps must be both illustrated in an attractive drawing and written down as a sentence or paragraph. <p>Share the draft design of the poster with family members and use the feedback to revise the poster.</p> <ul style="list-style-type: none"> • Also, come up with a week or month-long challenge for your family to save water based on the steps: examples include: <ul style="list-style-type: none"> - Use buckets to clean your body instead of showering. - Recycle water used in washing vegetables and use it to water plants. - Keep the tap turned off when you are brushing your teeth, lathering your hands with soap to wash them, or scrubbing the dishes.
5 minutes	<ul style="list-style-type: none"> • Share with your family the poster and challenge. • You and your family members should carry out the challenge for a week or month and reflect with your family at the end of the week or month to discuss what they learned and challenges they faced, what worked and what did not work and what needs to be done to ensure water is not wasted.

Additional enrichment activities:	<ul style="list-style-type: none"> - Learners can track water consumption habits for several days and calculate daily consumption for those days - Learners can create a daily, weekly or monthly plan to save water and reduce pollution for their family - Ask the learner what he or she knows about carbon and carbon dioxide. If the learner is familiar with climate change and the effect of higher carbon dioxide in the atmosphere, ask him or her “what could the relationship between carbon
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and water be”? Explain to the learner that the water and carbon cycles are interconnected in the following ways:

1. Carbon dioxide is all around us! It is put into the atmosphere by plants, animals, and human activity. It is also released from water bodies into the atmosphere and absorbed into water bodies from the atmosphere.
2. Carbon dioxide along with other gases creates what is called a **greenhouse effect** where the sun’s heat is trapped in the atmosphere. We need these gases because without them the earth’s temperature would be -18 degrees Celsius! The problem now is that there is too many of these gases and the earth is hotter than it should be
3. Higher temperatures because of higher carbon dioxide leads to more evaporation from water bodies
4. This creates more water vapor in the atmosphere, which could make earth even warmer given the general increase in temperature (due to high levels of carbon dioxide in the atmosphere)



Source:

http://www.coolgeography.co.uk/advanced/Carbon_water_cycles_Life_Earth.php

5. The learner will draw a labelled diagram explaining the water and carbon cycle in a different setting (e.g., rainforest, desert etc.)

Modifications
for
simplification

- Learners can reduce the number of experiments done

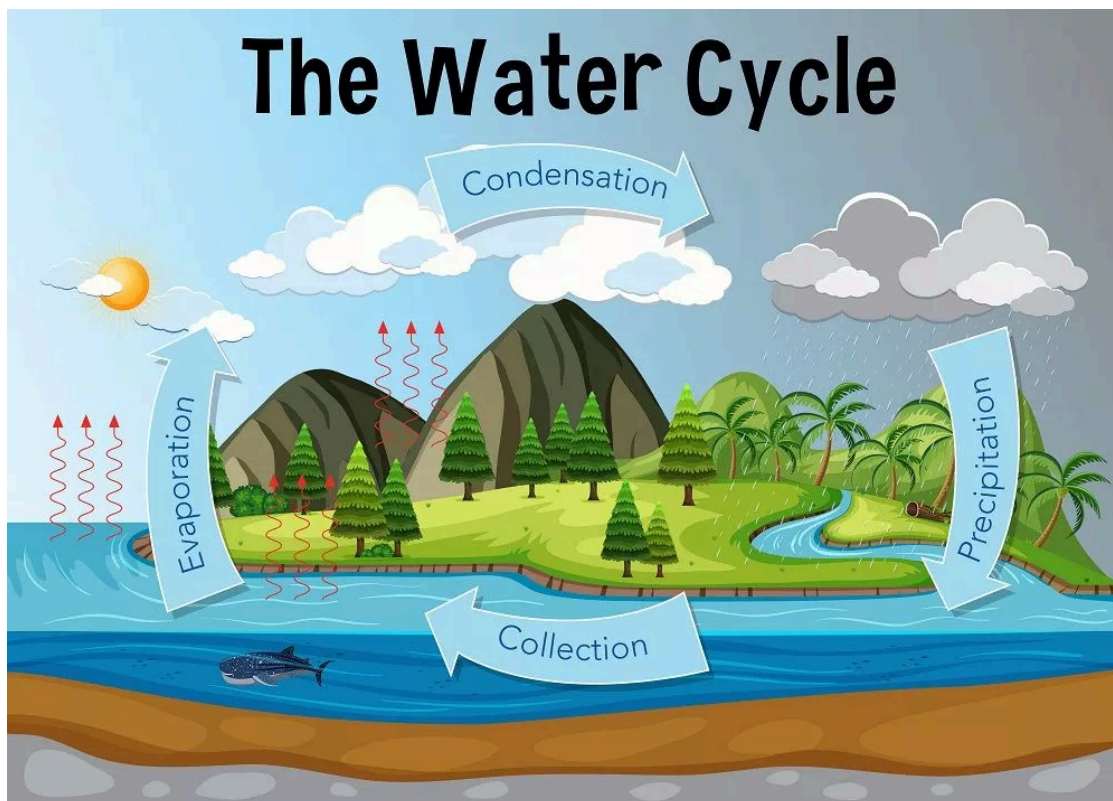
- Learners can reduce the number of experiments done and only complete the activities that cover the essential concepts – water is needed by living things to survive, water cycle, and water pollution.

ASSESSMENT CRITERIA

A majority of my learners were able to:

- Complete the table tracking water consumption.
- Complete the poster with suggested steps to reduce water consumption and pollution.
- Challenge families to reduce water waste and pollution.
- Correctly execute all experiments.

APPENDIX 1



Source: <https://biologydictionary.net/water-cycle/>