

Water

Key Stage 2 Thematic Unit

Supporting the Areas of Learning and **STEM**



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This Thematic Unit is for teachers of Key Stage 2 children. Schools can decide which year group will use this unit and it should be presented in a manner relevant to the age, ability and interests of the pupils.

This Thematic Units sets out a range of teaching and learning activities to support teachers in delivering the objectives of the Northern Ireland Curriculum. It also supports the STEM initiative.

Processes

Planning for the theme.

Finding out about the processes involved in water treatment.

Investigating to develop understanding of the terms aeration, coagulation, sedimentation, filtration and disinfection.

Investigating evaporation and condensation.

Carrying out experiments to investigate solubility and the factors that affect the solubility of various substances.

SECTION 1



Activity 1

Drop - Let's Plan!

New Words and Phrases

reservoir
water
treatment
plant

Suggested Learning Intentions

We are learning to:

- pose relevant and open-ended questions;
- express and share our ideas and opinions;
- contribute to the planning for our learning;
- use what we have learned in other areas to help us with our learning; and
- work with others to reach an agreement or come to a decision.

Divide the class into small groups. Give each group some post-it notes and ask the children to write any questions they have about water on them. This will underpin their learning throughout the unit. It may be an idea to provide the children with a set of photographs to stimulate their thinking. These could include photographs of:

- dirty water
- clean/fresh water
- water treatment plant
- reservoirs
- dams
- water pumps
- tunnels
- underwater scenes
- submarines
- floods
- flood barriers
- plumbers
- pipes (various)
- polluted water



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Encourage the children to include questions such as:

- Where does our water come from?
- How is our water cleaned?
- How does our water get to our homes?
- What kinds of structures are built to move water?
- What structures are built to contain our water?
- What problems can dirty water cause?
- Do we all have access to clean water?
- What happens in times of too much rain/water?
- What happens in times of too little water/rain?
- How do we use water?
- Can water be destructive?

CONNECTED LEARNING OPPORTUNITIES

Divide the class into groups. Give each group one or two photographs of water in various contexts, for example, the seaside, an oasis, people washing clothes in a river or famous scenes such as the Niagara Falls. Ask the children to make links to other Areas of Learning by brainstorming and recording their ideas.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Create and share success criteria for this activity with the children. Use a strategy such as 'Thumbs Up' to help pupils decide if they have achieved the success criteria.

This list is not exhaustive but provides examples of appropriate questions which could underpin the learning throughout the theme. Discuss the questions written by the children. Use a strategy such as **Priority Pyramid*** to sift through the questions with the children and decide on those which are most important or relevant. Write the key questions onto a number of large pieces of card shaped like water drops and add these to a display or planning board.

As learning takes place the children may like to include key points about what they have learned on the display, perhaps on different coloured raindrops.

Alternatively a **KWL Grid*** could be used as a first activity or children could draw a mind map related to the topic of water. However, as the theme is so broad it is probably better to use a stimulus like photographs to focus the children's thinking.

* see *Active Learning and Teaching Methods for Key Stages 1&2*.

Activity 2

Giving it the Treatment

New Words and Phrases

aeration
coagulation
sedimentation
filtration
disinfection

Suggested Learning Intentions

We are learning to:

- select and classify information;
- plan and carry out experiments;
- predict outcomes;
- record findings;
- draw accurate conclusions; and
- process and clean water using filtration.



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Use the information gathered by the children to help them identify the stages of water treatment, which are:

- aeration;
- coagulation;
- sedimentation;
- filtration; and
- disinfection.

What is a Water Treatment Plant?

Use suitable search engines to allow the children to look at photographs of a water treatment plant. The Northern Ireland Water website is useful for this activity, it has a wealth of information about water, including links to 'Water Cleaning' and 'Drinking Water'. It can be accessed at www.niwater.com (follow the links to the children's area, 'What are you doing with water?'). Let the children have some time to carry out research on what happens at a water treatment plant. Ask children to consider the following key questions:

- How is our water cleaned?
- Where is our water treated?
- Where does our water come from?

Recreate a Water Treatment Plant

In order to further deepen the children's understanding of the processes which take place at a water treatment facility, work with the children to design activities which replicate the processes involved.

You will need:

- 2 litres of water;
- A cupful of dirt/soil;
- 3 large 2 litre lemonade bottles (one with its cap);
- A jug or beaker which can hold 2 litres of water;
- 1½ cups of small pebbles;
- 1½ cups of fine sand;

CONNECTED LEARNING OPPORTUNITIES

The Arts

Explore the theme of dirty water and the problems it causes by engaging in role play situations, where children pretend to live in affected communities.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Evaluate Previous Work!

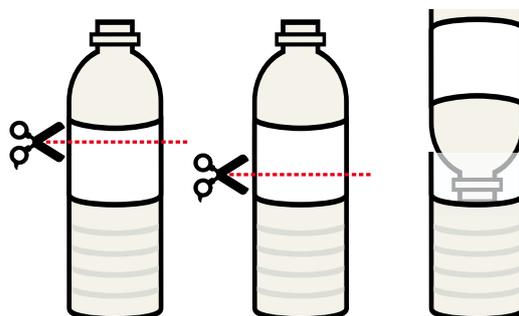
Discuss times in previous work when the pupils have carried out scientific experiments/activities. They should consider what processes they engaged in, including planning or designing, predicting, carrying out, observing and recording, drawing conclusions. Ask them to consider how this can help them with the activities they are now going to be involved in.

- 1½ cups of coarse sand;
- A coffee filter;
- A large rubber band or sticky tape;
- A tablespoon;
- A large spoon;
- 2 tablespoons of alum (optional); and
- A stopwatch.

Alum can be found in the spices section of supermarkets. It accelerates the coagulation process, without it the coagulation is less dramatic.

Method:

1. Add the dirt to the water. Discuss with the children how the water is now unsuitable for drinking. Consider how the water we drink is like this before it is treated.
2. **Aeration:** To begin the cleaning and purification process, pour the mixture into a large 2 litre bottle and shake vigorously for a few minutes. Then transfer the water mixture from the bottle to a beaker or large jug and back again. Continue to pour the mixture from the bottle to the beaker and back again, over and over, for about ten minutes. This adds air to the water and removes other gases caused by the dirt.
3. If alum can be sourced then add it to the mixture in the large beaker or basin. Stir in and allow the **coagulation** to occur.
4. If alum cannot be found simply allow the water mixture to settle for at least twenty minutes. Observe how the dirt settles and forms at the bottom of the beaker. This is called **sedimentation**.
5. **Filtration:** To construct the filter you need to cut the two remaining 2L bottles as shown:



6. Remove the lid from bottle 1. Attach the coffee filter to the top using a rubber band or sticky tape. Invert the top piece of bottle 1 into the bottom piece of bottle 2.
7. Pour the small pebbles into bottle 1, pour the coarse sand on top then the fine sand. Test to make sure it works by pouring 2 litres of clean water slowly through the filter. Observe what happens and record. Pour the 'rinsed' water out of the bottom container. Explain to the class that they are now going to pour the dirty water through the filter. Can they predict what the outcome will be? What do they think the water will look like when it comes out the other end?
8. Pour two thirds of the dirty water through the filter. Any sediment which gathers should be left in as this is what would happen in the sediment beds in a treatment plant.

Get the class to record the outcome in a variety of formats, for example, diagrams, tables, pieces of writing or photographs. Ask them to compare the filtered to the non-filtered water. Explain that the last stage in water purification is **disinfection**. However, it is not safe to use the necessary chemicals in classrooms. Instead the children should research what chemicals are used at the water treatment plant.

Activity 3

Solar Filtering

New Words and Phrases

evaporation
condensation

Suggested Learning Intentions

We are learning to:

- apply our knowledge of scientific processes to solve a problem; and
- understand evaporation and condensation.

Stranded!

Ask the class to imagine that they are stranded on an island and get them to consider what they would need to survive. Make a list of their suggestions. Tell them that on the island they only have a supply of water that is dirty. How could they separate the water and the dirt? Tell the children that the only equipment that they have is:

- Warm sunny weather
- A basin
- A smaller bowl
- Dirty water
- Cling film
- A large rubber band
- Three pound coins.

Working in small groups, ask the children to plan a method that will allow them to separate the dirt from the water, using only the equipment listed. They should draw this plan out on a page, annotating the various stages of their method. When the children have had an opportunity to do this, ask each group to feed back to the rest of the class on the method that they would use. Discuss each method and encourage the rest of the children to comment on the advantages and shortfalls of each method.

You may like to use a strategy such as **Two Stars and a Wish*** to do this.

Now tell the children about the actual method for doing the task of separating the dirt from the water as outlined below and allow them to set up the equipment or watch as you demonstrate.

Method:

1. Pour the dirty water into the basin. Place the smaller bowl in the centre of the basin; it should sit on the bottom of the basin, not float.
2. Cover the top of the basin with a layer of cling film. Place the weight or the coins on top of the cling film directly above the smaller bowl so that an indent is caused above it.
3. Place the basin outside in direct sunlight. Give the children opportunities to make detailed observations of what happens during the day or next few days.

As they are doing this, encourage the children to talk about their observations and to make predictions about what will happen as the activity progresses.

* see *Active Learning and Teaching Methods for Key Stages 1&2*

CONNECTED LEARNING OPPORTUNITIES

The World Around Us

Revise prior learning about the water cycle. Find out about places and people in the world affected by dirty water and locate on world maps.

Personal Development and Mutual Understanding

Link to work on human rights and social responsibility. Discuss the rights to clean water of all children.

The Arts

Design posters to highlight the plight of children who have no clean water.

Using ICT

Use computers to create posters.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Make a table to record the children's predictions as they carry out the activity. Compare and contrast the predictions with the actual outcomes.

What Should Happen?

- The water should evaporate and then condense on the cling film.
- The indentation causes the condensed water to run down to the centre of the cling film and drip into the small bowl in the centre.
- When the cling film is removed, the cleaned water will be in the bowl and the dirt and grass will be in the basin.

Discuss what has happened with the children and introduce the terms **evaporation** and **condensation**. Ask the children if they can think of other ways to separate the dirt and the water. Discuss and explore with the class the problems caused by lack of access to clean water which affects many people in our world.



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Activity 4

Soluble Solutions

New Words and Phrases

substances

fair tests

soluble

insoluble

dissolve

saturation point

Suggested Learning Intentions

We are learning to:

- plan and carry out fair tests;
- understand the need for testing to be fair;
- understand what happens when a substance is dissolved; and
- know that some substances dissolve and others do not.

Introduce the terms '**soluble**' and '**insoluble**' to the children and ask them to think about what it means. If appropriate, use dictionaries to allow them to find out the answer.

- **Soluble** – a substance that will dissolve in a liquid – it will seem as though it has disappeared and become part of the liquid.
- **Insoluble** – will not dissolve in a liquid and will remain separate.

Show the children the following substances and equipment:

Substances:

- sand
- salt
- sugar
- flour
- coffee
- pepper or similar.

Equipment:

- water: warm and cold
- measuring jug or cylinders
- clear beakers or containers to mix the solutions in

- spoons to stir the solution
- thermometer (optional)
- stopwatch.

Planning

Ask the children to consider how they could find out the answers to the following questions:

- Which substances are soluble and which are not?
- Does the temperature of water affect the solubility of a substance?
- Does stirring affect solubility?

It may be more appropriate for each group to investigate only one question or investigate each question during a different session, so that they only have to focus on one variable at a time.

Before handling the equipment, the children should work together in their groups to design an experiment or experiments that will answer the questions. The children should draw or write out their method, outlining the process step-by-step.

CONNECTED LEARNING OPPORTUNITIES

The World Around Us

Use what you have learned in Activity 3 when trying to recover the dissolved substances from the solution.

ASSESSMENT FOR LEARNING OPPORTUNITIES

A checklist could be compiled to ensure that a fair test has been designed and carried out. Ask the children to discuss and create this checklist. As the activities are being carried out, each group could either evaluate their own work or the work of another group by using the checklist to check their work.

Discuss with the children the importance of and need for fair tests. Explain how in fair tests one variable changes but everything else should remain the same. This will ensure that a fair test takes place. When the children have had the opportunity to plan out their experiment(s), discuss the various methods with the children and whether they would work or not.

Methods

If appropriate, you can share the following methods with the children:

Experiment 1: Which Substances are Soluble and Which are Not?

Take six beakers and put the same amount of cold water into each. Put one spoonful of a different substance into each beaker. Predict which substances will dissolve or not. Record your predictions. Leave the beakers for twenty minutes and then check whether the substance has dissolved or not. Record your results.

Experiment 2: Does the Temperature of Water Affect the Solubility of a Substance?

Take two beakers of each substance that you are going to test. Put a spoonful of each substance into a pair of beakers. Put an agreed amount of cold water into a measuring jug. Use a thermometer to take the temperature (optional). Pour the water into the beaker with the substance and using a stop clock, see how long the substance takes to dissolve. Record these results. Repeat this process for the warm (tap-warm, not boiled) water.

Repeat the whole process for the other substances.

Experiment 3: Does Stirring Affect Solubility?

Take two beakers for each substance that you are going to test. Put a spoonful of the first substance into two of the beakers. Put an agreed amount of cold water into one of them. Use a stopwatch to time how long it takes the substance to dissolve. Record the time taken. Repeat the process for the

second beaker, but this time use a spoon to continually stir the water and record the time taken for the substance to dissolve. Repeat the whole process for the other substances and record the results.

Give each child a copy of Resource A, Dissolving Substances. They can use this resource on which to record all of their results. Alternatively, you may get them to work out their own method of recording the results.

Introduce the idea of **saturation** to the children. Explain to them that when a soluble substance is added to water, eventually so much will have dissolved in the water that the water is unable to hold any more. This is called the **saturation point**. Demonstrate the concept to the children using a sponge. The sponge can hold a lot of water, but after a certain point it cannot hold any more water.

Analyse!

From their results, ask the children to analyse what they have found out in the experiments. You could use the following questions to tease out the learning that has taken place:

- Were your predictions correct?
- Which substances are soluble and which are not?
- Why do you think this was the case?
- Is there anything similar about the substances that were soluble (particle size for example)?
- Does the temperature of water affect the solubility of a substance? How?
- Does stirring affect solubility? How do you know this?

Structures

Finding out about the water table and aquifers and the role played by porous rock.

Investigating how people gain access to water, for example, wells and reservoirs.

Finding out about hydropower and the use of water turbines.

SECTION 2



Activity 5

Well! Well! Well!

New Words and Phrases

the water table
aquifer
ground water
porous rock
saturation

Suggested Learning Intentions

We are learning to:

- know that some rocks can soak up water and others cannot;
- understand where some of our water comes from;
- generate ideas and value the ideas of others;
- experiment with designs;
- use terms such as volume and capacity; and
- measure and record volume.

The Water Table

Introduce the term 'water table' to the class. Use suitable search engines or books to explain to the children, in simple terms, what the water table is. The following information may help:

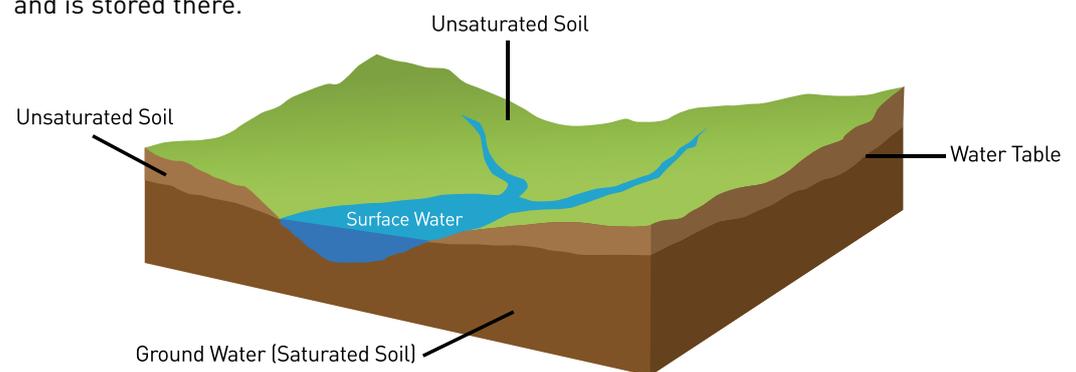
Some ground water lies underneath the Earth's surface all around the world. These underground pools of water are called aquifers.

Sometimes aquifers can be found close to the surface of the earth. At the surface of the earth, there are little spaces between the rocks and stones in the ground.

Rainwater finds its way into these spaces and is stored there.

The further you go towards the centre of the earth, the weight of the rocks above presses down and presses the rocks together, getting rid of any of these gaps. That is why the aquifers are only found towards the surface of the earth.

The water table is the point at which the ground, going down from the surface, becomes totally saturated with water. This is at the top of the aquifer.



CONNECTED LEARNING OPPORTUNITIES

The World Around Us

Make models from items of household waste. Link to study of reducing pollution by recycling, reusing and reducing.

Language and Literacy

Read and discuss poems and stories about wells. Consider what your life would be like without running water.

Personal Development and Mutual Understanding

Explore how we take water for granted.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Evaluating the effectiveness of designs in this activity is the main opportunity for Assessment for Learning. Use a strategy such as **Two Stars and a Wish*** to provide positive feedback and to help children make improvements to their designs.

* see *Active Learning and Teaching Methods for Key Stages 1&2*

Like a Sponge!

Demonstrate the concept of the water table to the children by using two sponges.

Lay one sponge on top of the other and pour water slowly onto the sponge at the top. The children will see that the water will seep down to the bottom sponge. When you stop adding water, the children will see that the sponge on top dries out, while the water continues to move downwards and drip out of the bottom sponge.

Next, put a thick piece of plastic between the sponges. This will make the bottom sponge non-absorbent, just like layers of rock lower down in the earth. This time, when you pour water onto the top sponge, the water will saturate the top sponge, but will be unable to continue down to the bottom sponge. The children will see that this is like the aquifers, when water is unable to keep moving downwards and so it moves sideways into rivers or lakes.

Porous Rocks

If possible, investigate the porous nature of a rock such as sandstone or limestone. If you can obtain a piece of either rock it can be used to exhibit how rock can soak up water. The children could set up an investigation to measure the amount of water the porous rock will soak up. An example of one such investigation is outlined below:

1. Weigh the rock and record its weight.
2. Place the rock in a jar of water and let it soak overnight.
3. Ask the children to predict what they think will happen to the level of the water in the jar and to the weight of the rock.
4. After the rock has soaked overnight, shake the excess water from the rock and weigh it again. Record the weight.

Discuss the outcomes with the class posing various questions for them to consider, including:

- How can you account for any change in the weight of the rock?
- How can some rocks hold water?
- Do all rocks hold water?

How Do People Access Water?

Using information from photographs, books and the Internet, help the children compile a list of structures which are associated with water. Get them to research how water has been accessed by people throughout the ages to the present day, for example, through the use of wells and pumps. Explore how in many parts of the world the building of wells and the location of pumps is still a major priority for many communities. Ask the children to find out about an organisation or charity such as Trocaire or Oxfam who help bring clean drinking water to places and people without any.

Make a Well

Ask the class to investigate how they could make a mechanism that would lower and raise a bucket so that it can go down into a well and collect water. Ask the children to design the mechanism. They will need to consider how they will add a handle to their design, so that they can control the mechanism as well as being able to lock it to keep the bucket at the top when it is not being used. The children can then use junk, art and technology materials to build their design.

Get the children to find out about methods of well construction, such as, digging, driving, boring and drilling. If appropriate, use Ordnance Survey maps to locate the position of wells, pumps and/or springs in the locality. Find out if these are still in use and who uses them.

Activity 6

Classy Constructions

New Words and Phrases

reservoir
construction
construction
worker

Suggested Learning Intentions

We are learning to:

- estimate volume;
- understand the relationship between units and convert from one metric unit to another;
- know how locations in Northern Ireland depend on one another;
- understand how water is collected and stored for our use;
- know about some of the jobs connected to the provision of water; and
- use traditional and digital maps to locate places and geographical features.

Use a local example of a reservoir, such as Silent Valley, Lough Neagh, Banagher or Spelga, ask the children to find out:

- what a reservoir is;
- how they are built; and
- where they are constructed.

Ask the children to locate the reservoirs named previously on maps. Do they know where the water in their local area comes from. Use a website such as www.niwater.com to show the children how the water that they drink gets to their home and the role of reservoirs.

If possible, interview construction workers who have been involved in the building or maintenance of a reservoir or arrange a visit to a local reservoir to talk to someone about the processes that take place there.

Ask the children to construct their own reservoirs, using large basins or aquariums, construction sand and pebbles. See which group's construction can hold the most water. Ask the children to

estimate how much their reservoir will hold (by using measuring jugs and beakers to make an estimate). Convert these measurements from cubic centimetres and millilitres into litres.

Discuss with the children what dams are and what their purpose is. It's a good idea to show them a number of photographs of dams around the world (you could also show them a picture of a dam built by beavers). Ask the children to think about the problems you would encounter when building a dam.

In groups, the children discuss how they could construct their own dams in basins or aquariums. They should consider the type of materials they will use and how they will go about building it. Challenge the children to test the strength of the dam they build. Can they think of ways to improve the capacity of their construction? The children should use digital cameras to record what they do and annotate the photographs.

CONNECTED LEARNING OPPORTUNITIES

The Arts

Design postcards for the areas around the reservoirs of Northern Ireland.

Language and Literacy

Write mini tourist brochures to promote areas of natural beauty.

The World Around Us

Compare how we transport water today to civilisations in the past, for example, the

Romans. Look at pictures of aqueducts and discuss the problems that the Romans would have encountered building these structures without modern machinery and technology.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Dot Voting!

Use a strategy such as **Dot Voting*** to get children to vote for their favourite work.

* see *Active Learning and Teaching Methods for Key Stages 1&2*

Activity 7

Water Power!

New Words and Phrases

hydroelectricity
hydropower
renewable
energy
energy
sources
water turbines
irrigation
irrigation
channels

Suggested Learning Intentions

We are learning to:

- recognise the need for renewable energy sources;
- understand the advantages and disadvantages of non-renewable energy;
- constructively comment on the ideas of others; and
- make decisions and judgements.

Hydropower

Introduce the terms hydropower and hydroelectricity to the children. Give the class time to research these terms and to agree a brief definition of the terms. Useful information and video clips can be found by going to www.howstuffworks.com and searching for 'hydropower'.

Using suitable search engines, ask the children to find out about real life hydroelectric projects, for example the Three Gorges Dam in China, or the Hoover Dam in the USA. Relevant websites are given in the 'Additional Resources' section of this resource.

Use the **Five Questions*** strategy to explore the benefits of hydropower/hydroelectricity as a renewable source. The initial question for use with this strategy could be, "Why is hydropower a good idea?" or "How can hydropower benefit the world?"

Alternatively, the class could research reasons why hydropower is a beneficial energy source and carry out an activity such as **Diamond Ranking*** to prioritise their reasons and ideas. Ask the children to explain why they have ranked their ideas in such a way.

* see *Active Learning and Teaching Methods for Key Stages 1&2*



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CONNECTED LEARNING OPPORTUNITIES

The World Around Us

Research the Bushmills Railway, which was the first railway powered by hydroelectricity in the world. Investigate how in the past waterwheels powered mills and factories. Explore why we are returning to hydropower today. Explore places in the world where irrigation is an important feature of farming. Research where and how rice is grown in water logged fields.

Using ICT

Create a large drawing of an irrigation system. Program a digital device such as Roamer or Beebot to travel along and around the drawing.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Quality Questioning!

Use more open-ending questions to encourage children not just to focus on the 'what' but more on the 'how' and 'why'. Allow 'thinking time' so that all children have the opportunity to contribute.

Building a Simple Water Turbine

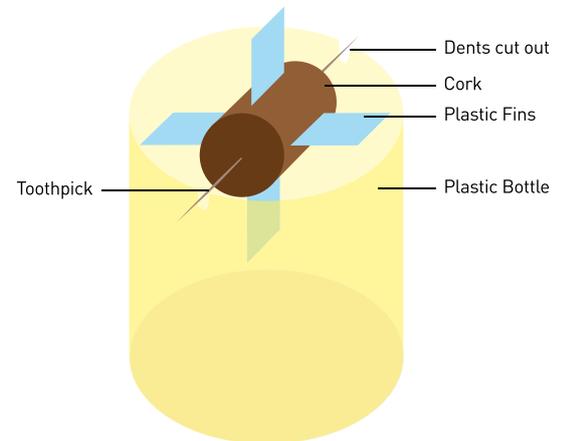
In order to deepen the children's understanding of what a water turbine is, get them to make a small model turbine using the following equipment and method:

Equipment:

- a cork
- plastic strips cut from large plastic juice bottles
- two toothpicks
- the base of a plastic bottle (about 6cm deep)
- sticky tape

Method:

- Cut four strips of plastic about 3cm wide from lemonade or juice bottles. They should be approximately the same length as the cork.
- Use the sticky tape to attach the strips of plastic to the cork, they should be placed at right angles to the cork and protrude like fins.
- Push one toothpick into the centre of the base of the cork and the other into the top of the cork.
- Cut small dents on opposite sides of the base of the lemonade bottle to set the toothpicks on so that they will not move.
- Hold the model turbine below a tap and over a sink. Turn the water on.
- Allow the children to observe what happens. Explore how to make the turbine turn slower or faster.



It's In Everything

Understanding how water makes up a large percentage of all living things.

Carrying out experiments to find out how much water is in food.

Investigating various water habitats and the living things that can be found there.

Researching and understanding the extreme force of water in nature.

SECTION 3



Activity 8

Water, Water, Everywhere

**New Words
and Phrases**
hypothesis
recommended
daily intake
percentage

Suggested Learning Intentions

We are learning to:

- know that water covers vast areas of the earth;
- understand that we get water from our food;
- work out how much water certain fruits contain;
- make sensible and reasonable deductions; and
- record our findings in a variety of formats.

How Much?

Ask the children to investigate the amount of water covering the earth's surface (they may use a suitable search engine or an encyclopedia). Challenge them to think of as many different ways as possible that they can express this fact using the mathematical language of fractions, decimals and percentages.

Introduce the term 'hypothesis' to the children and tell the children that you are putting the following hypotheses forward:

Our food contains water and that we obtain some of the water we need daily from what we eat.

Do the children agree or disagree with the hypothesis? Ask them to think of how they could prove or disprove the statement.

Fruit

Show the children some items of fruit and vegetable and ask them to estimate how much water there is in each one. Depending on the experience of the children, they may be able to give this amount in fractions or percentages. Get the children to consider how they could plan an experiment that would show how much water there is in the food items. When the children have had an opportunity to think about how they could carry out this experiment, either use an agreed method or follow the suggested one outlined overleaf.



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CONNECTED LEARNING OPPORTUNITIES

Personal Development and Mutual Understanding

Find out the recommended daily intake of water. Find out how much water our bodies need to maintain health. Create a class survey to see how much water everyone drinks in a day.

Mathematics and Numeracy

Calculate how much water individuals need to consume to be healthy.

Language and Literacy

Design posters to promote drinking water, outlining water's benefits for a healthy body. Prepare and deliver a talk to another class persuading them of the benefits of drinking more water.

The World Around Us

Investigate how food is preserved by removing water and which foods are preserved in this way.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Allow the children to create a mini **KWL* Grid**. First, they should consider what they know about water in their food, then what they would like to find out. After the activities they could complete the grid by including what they have learned through carrying out the activities on the food.

* see *Active Learning and Teaching Methods for Key Stages 1&2*

1. Divide the class into small groups and provide each group with:
 - an apple;
 - a piece of cucumber;
 - an orange; and
 - a tomato.
2. The children should weigh the fruit, record the weights and photograph the fruit. Get the children to predict and estimate any changes that may occur in the fruit. The fruit should then be placed in a dry and warm place in the classroom for a week.
3. Each day, get the children to check the fruit and record any observed differences in the fruit or photograph it and annotate the photographs.
4. At the end of the week (or two weeks if necessary), the fruits should be reweighed and the results recorded.
5. Ask the children to compare the weights as the fruits dry out and draw conclusions about the amount of water the fruits contained at the beginning. They could calculate the percentage and/or fraction of water lost by the fruit during the period of the experiment. They could display results in a variety of formats.

Bread

Another simple activity can be carried out using bread. Divide the children into small groups. Allow the children to draw around a slice of bread on a sheet of A4 paper. The slice of bread should be weighed and the weight recorded. The bread should then be toasted.

Ask the children to observe that water is evaporating by watching you hold a piece of cold metal above the toaster. Condensation should be evident on the metal. Remove the toast from the toaster and place it on the original outline. The children should observe the change in size of the slice of bread. Lead the children to realising that water has been removed from the bread. Weigh the slice of toast and calculate the weight difference. Use the findings to estimate how much water there is approximately in several slices of bread or a whole loaf.

Activity 9

It's Nature

New Words and Phrases

species
life cycles
diversity
feeding grounds
breeding grounds
aquarium
fish farm

Suggested Learning Intentions

We are learning to:

- use the skills of planning, drafting and redrafting to improve our writing;
- create, organise, refine and present ideas using traditional and digital means;
- know about the conditions necessary for life in a variety of places; and
- know about some of the plants and animals in a habitat.

Under the Sea

Get the children to make a list of all of the types of bodies of water that they can think of, suggestions may include:

- sea;
- ocean;
- rock pool;
- swamp;
- marsh;
- bog;
- lake; and/or
- river.

Get the children to brainstorm the animals and plants which live in or near these different types of water. Ask them to focus on one of these animals and create a mini-project based on it. For example, the children could research the life cycle of the fresh water eels which are found in Lough Neagh. They could trace their journey from the Sargasso Sea, near Bermuda, to the Lough Neagh and the rivers of Ireland. Get the children to record the stages of the journey and life of the eels and create a display. Alternatively, the children could research the lifecycle of the salmon or

the whale and follow their journey, from breeding grounds to feeding grounds. The BBC has a variety of clips on Lough Neagh and Strangford Lough and the wildlife that live around them. These clips can be accessed by going to www.bbc.co.uk/northernireland/forteachers/water and clicking on 'Our Loughs and Rivers'.

Explore the diversity of plants and animals which live in the oceans and seas around our island. They could use a website such as <http://www.habitas.org.uk/marinelife> which is the encyclopedia of Marine Life of Britain and Ireland.

Get the children to undertake a 'compare and contrast' of these to another ocean or sea elsewhere in the world, such as The Great Barrier Reef. Allow them to look on <http://www.greatbarrierreef.org> for information about The Great Barrier Reef. Ask the children to group and classify the types of creatures identified in different seas and oceans. The children could create a chart of all types of fish found both here and in more exotic places.

CONNECTED LEARNING OPPORTUNITIES

Using ICT

Create digital presentations to illustrate the variety of fish and animals which inhabit an area. Investigate how coral forms and create a digital display to illustrate.

The Arts

Create a seascape in 3D and display on the wall. Add images of fish and other sea creatures as the children find out about them. Use a variety of materials and decide which are best.

Mathematics and Numeracy

Find out costs for certain fish and carry out Maths problems related to shopping lists for recipes.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Positive Feedback!

Allow the children to read each other's mini projects and create positive affirmations to provide feedback to each other.

Aquarium

In groups, set the children the task of finding out about the 'weirdest' underwater creature. If you have access to the BBC DVD 'Planet Earth', let the children watch the 'Ocean Deep' programme, which will introduce them to lots of these weird and wonderful underwater creatures. Alternatively, visit a website such as www.underwatertimes.com where you can find lots of news articles to share with the children about weird and interesting things that have happened in seas and oceans. Click on the 'Sections' tab and select 'Underweird' from the list. It is advisable to do this prior to the lesson rather than allow the children to have free access*.

The children should find out three facts about this creature and create a short presentation to be presented to the rest of the class. If possible, visit the Exploris Aquarium in Portaferry to find out about the diversity of ocean life. See 'Suggested Additional Resources' Section for more websites.

Get the children to research the costs involved in creating a mini-aquarium. They should calculate the costs involved in buying a tank, buying and feeding three exotic fish and any other water additives or tank furniture they would like to have.

Can you Farm a Fish?

Find out the names of fish available in local fishmongers or at the fish counter in the local supermarket. Ask the children to trace the fish back to its place of origin and identify what type of water it lives in. Visit or locate local fish farms in Northern Ireland. Identify what type of fish they farm. Find out about the way the fish are kept, fed and processed. Ask the children to compare and contrast the life of a fish grown in a fish farm to one that has been born in the wild.

***Note:**

CCEA is not responsible for the content of external websites and teachers should exercise due diligence to ensure that content is suitable and age appropriate.



Activity 10

It's Dangerous!

New Words and Phrases

tsunami

natural

disaster

flood barriers

ice caps

global warming

global issues

Suggested Learning Intentions

We are learning to:

- represent information taken from texts in a variety of ways;
- appreciate the impact on people and places, of extreme weather conditions; and
- know the ways in which communities are protecting themselves from the destructive force of water.

Climate Change

Set the children a task of finding out about events around the world that have shown the extreme force of water in nature, including newspaper reports or film footage about floods and tsunamis. There are a number of websites mentioned in the 'Additional Resources' section that will be a useful for this research.

The children should compile 'evidence boards' to illustrate the effects of these natural disasters on people and places. The boards could also be used later to discuss the connection between climate change and the rise in extreme weather and natural disasters.

Use a strategy such as **Five Questions*** to begin to explore what climate change is and the main consequences of it. Get the children to find out how climate change is affecting the weather and water bodies of the world and the effect this is having



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on animal life in the oceans. The children could find out about the melting ice caps and the impact this is having on water levels all around the world and on the animals which live near the poles, for example, polar bears.

Ask the children to use a **Fishbone Strategy*** to explore the causes and effects of climate change.

* see *Active Learning and Teaching Methods for Key Stages 1&2*

CONNECTED LEARNING OPPORTUNITIES

The Arts

Create a collage to depict the destructive force of water in nature. This can include photographs, headlines, dates, numbers of deaths, places and words to describe the impact of such natural disasters.

Language and Literacy

Write diary accounts of people caught up in natural disasters.

The World Around Us

Explore how the Ancient Egyptians used the flood waters of the Nile.

Using ICT

View the Nile River on Google Earth (or similar website). Discuss the contrast between the land on either side of it and the rest of the arid land of Egypt.

ASSESSMENT FOR LEARNING OPPORTUNITIES

Imaginary Number Line!

Get the children to place themselves along an imaginary number line depending on how confident they feel about their knowledge of various aspects of the theme. Repeat this activity after the learning has taken place to allow the children the opportunity to focus on how their knowledge has developed.

Flood

Arrange a visit to or carry out research on flood barriers, such as those which have been built in Belfast. The Northern Ireland Rivers Agency website provides a list of flood defence projects, details can be found in the 'Additional Resources' section. Use recent reports from newspapers or television to discuss the impact of flooding in Northern Ireland. Explore what other measures are being taken in places in the British Isles or around the world to protect communities from the force of water in nature and extreme weather due to climate change.

Get the children to carry out a 'Compare and Contrast' on the differences between the negative impact that flooding has in some places, and the beneficial impact of flooding in the Nile Valley in Egypt, for example.



Working With Water

Finding out about some of the people whose jobs are linked to water.

Understanding how buoyancy works.

Investigating water pressure.

SECTION 4



Activity 11

The Plumber

New Words and Phrases

plumber
copper
rust
waterproof
lubricant

Suggested Learning Intentions

We are learning to:

- know about what a plumber does;
- understand how some metals rust while others do not;
- understand how some metals can be made waterproof; and
- recognise the dangers of electricity and water.

Interview

If possible, invite a local plumber to come in to the class. Get the children to brainstorm questions which could be asked prior to the visit. Use a strategy such as **Priority Pyramid*** to help the class identify the most appropriate and relevant questions that they should ask the plumber.

Before the children interview the plumber, create the following grid:

What I think I know about the work of a plumber	What I was right about	New things I have learned

Ask the children for suggestions for the first column and record these on the grid. When the children have interviewed the plumber, spend time with the children completing the other two columns. The children could create a fact file about the work of a plumber.

* see *Active Learning and Teaching Methods for Key Stages 1&2*

Find Out More

As an extension to the interview, spend some time with the children researching and investigating some of the following:

- Find out how central heating works in our homes by pumping hot water in a series of pipes and radiators.
- Design and carry out simple activities to identify why copper or plastic are used as pipes. For example, place small samples of a variety of common materials (including copper and plastic) in containers filled with water and observe and record findings over a period of time. Discuss with the children how air is also a component in the rusting process.
- Explore ways of water proofing metals. Look for examples of how bridges or machine parts are protected from rust. Carry out simple activities to see how to protect metal. Use paint, oil and other lubricants and explore how effective each one is at protecting against water.
- Find out the length of piping for central heating or water in an average house. Calculate approximate lengths of piping in different rooms of their houses, in their classroom and school.

CONNECTED LEARNING OPPORTUNITIES

The World Around Us

Explore the dangers of working with electricity and water. Carry out simple and safe experiments to show how water is a conductor of electricity. Research early central heating systems, for example, the under floor heated water system of Roman villas.

Language and Literacy

Compile fact files about other jobs which are connected to water, for example, sailors, submariners, marine biologists.

ASSESSMENT FOR LEARNING OPPORTUNITIES

WILF! (What I'm Looking For)

Get the children to create their own WILF sheet based on success criteria for creating a fact-file. They could use the WILF sheet as part of self and peer assessment at the end of the activity.

Activity 12

Submariners and Submarines

New Words and Phrases

submarine
submariner
submersible
water pressure

Suggested Learning Intentions

We are learning to:

- understand the term water pressure;
- know how a submarine works;
- discuss the outcomes of simple activities; and
- identify what we have learned.

Who?

Use a strategy such as **Jeopardy*** to generate children's ideas about submariners or submarines. In this strategy the children generate questions that have the answer 'submariner' or 'submarine'. Alternatively, generate questions to find out the different roles of submariners, as sailors, researchers, marine biologists and so on. They should choose one of these jobs and carry out some research to create a fact file.

Up and Down

Ask the children to research and find out how submarines work. Explain that the children are going to build model submarines. To make a model they will need:

- a tall narrow jar (like an olive jar);
- a rubber sheet or cut up balloon (use the end);
- a strong rubber band;
- a medicine dropper (such as an eye drop dispenser); and
- water.

Method:

1. Fill the jar almost to the top with water.
2. Put the medicine dropper in to the water and squeeze the pipette just a bit to allow a small amount of water into the dropper. Place the dropper on the water so that it is floating – if it can't float adjust the amount of water in the dropper.
3. Put the rubber sheet or balloon over the top of the jar. Stretch it tightly over the top of the jar and secure it using the strong rubber band.
4. Press down on the rubber sheet with your hand and observe what happens.
5. Now remove your hand. Observe what happens.

Note:

- When you press on the rubber sheet, the air is compressed in the smaller space in the jar and so it pushes down on the water.
- This increases the water pressure and adds more water to the dropper.
- The dropper starts to sink with the extra water.

* see *Active Learning and Teaching Methods for Key Stages 1&2*

CONNECTED LEARNING OPPORTUNITIES

The Arts

Children could discuss and explore what things may be seen from an underwater craft, such as a submarine. Create pieces of creative music to depict an underwater journey.

The World Around Us

Research the use of submarines in World War 2.

Physical Education

Devise and trial games based on the movements of submarines and warships.

ASSESSMENT FOR LEARNING OPPORTUNITIES

On raindrop shapes give the children time to write answers for the questions they identified at the beginning of the thematic unit in Activity 1. Alternatively let them complete the 'L' section of their KWL Grid.

- When the pressure on the sheet is released, the air resumes its normal space and exerts less pressure on the water.
- The extra water is pushed out of the dropper and it rises to the top.
- The ability of a submarine to float or sink depends on its buoyancy. Buoyancy is controlled by the ballast tanks, which are found in the submarine's inner shell. By taking water on board and releasing it, the submarine is able to surface or submerge.

Water Pressure

Illustrate water pressure to the children using the following simple activity:

- Get a plastic bag and a basin of water. Allow the children to put their hands in the water and ask them to record what they feel. Ask them to move their hands around in the water and see if they can feel the pressure of the water on their hands. Add more water and ask the children to see if that helps them to feel the pressure of the water on their hands. The feeling of water on their hands is a familiar sensation so the children may not be able to 'notice' the feeling of the water pressure on their hand.
- Next, ask them to put their hand into the plastic bag and then put their hand in the plastic bag back into the water. Be sure that the water does not flow into the bag. Ask the children how this differs. What do they feel this time? Is the pressure of the water more obvious? The children will notice that the water is pushing the plastic bag against their hand.
- The pressure is much the same as before (slightly more due to the size of the bag), but this time the water presses on the bag, which presses on their hand. This is a less familiar sensation, so they notice the pressure more.
- Allow the children to put both hands into the bag and spread them apart. This time, they will feel more pressure and will see the water pushing the sides of the bag inwards.
- Get them to open and close their hands while inside the bag. Ask them to try to explain what is happening. Help them to understand that the pressure they are exerting pushing the water back with their hands is countered by the pressure of the water pushing back against their hands.



Resources

Resource A

Dissolving Substances

Substance	Is it Soluble? Yes/No		Time Taken to Dissolve in Hot Water	Time Taken to Dissolve in Cold Water	Time Taken to Dissolve in Cold Water When Stirred
	Prediction	Result			
1					
2					
3					
4					
5					
6					
7					

Suggested Additional Resources

Useful Websites

Northern Ireland Water

www.niwater.com

Primary Resources

www.primaryresources.co.uk (follow links to geography and rivers)

Causes of Floods

www.coxhoe.durham.sch.uk (follow links to 'curriculum links'; geography; KS2 links)

Hoover Dam

www.ehow.com – search for 'Hoover Dam Information for Kids'

The Three Gorges Dam Hydroelectric Power Plant

<http://www.power-technology.com/projects/gorges>

BBC Learning Northern Ireland For Teachers – Water

www.bbc.co.uk/northernireland/forteachers/water

BBC Class Clips – What are the advantages and disadvantages of dams?

www.bbc.co.uk/northernireland/forteachers/for_teachers_videos – and search for 'Class Clips, Dams'

US Environmental Protection Agency – Climate Change for Kids

www.epa.gov/climatechange/kids/index.html

Rivers Agency – Flood Defence

www.riversagency.ni.gov.uk/index/flood-defence.htm

Underwater Creatures

<http://www.teachers.ash.org.au/jmresources/deep/creatures.html>

Encyclopedia of Marine Life in Britain and Ireland

<http://www.habitas.org.uk/marinelife>

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