LEARNING AND TEACHING ABOUT WATER IN OUR CLASSROOMS:

A SERIES OF LESSON PLANS FOR GRADES R - 7

Report to the
Water Research Commission

by

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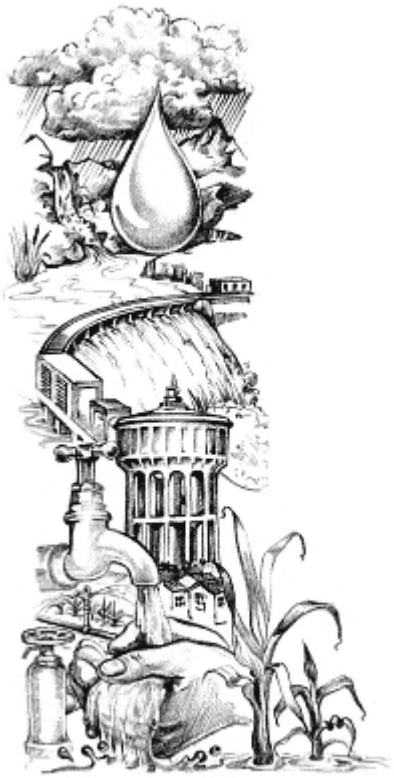
Executive Summary



South Africa is extraordinarily rich in natural resources – except for water. Water is a vital but scarce resource, distributed unevenly in time (frequent droughts alternate with periods of good rainfall) and space (the eastern half of the country is markedly wetter than the western half). Increasing demand for water, and decreasing water quality, make careful water management a priority in our country. It has been estimated that by the year 2025 South Africa's human population will have doubled, and there will not be sufficient water for domestic use, agriculture and industry.

Our average rainfall is less than 500 mm a year. The driest part of the country receives less than 200 mm a year and the wettest part receives more than 2 500 mm a year! Rain does not always fall where it is most needed, and some areas of high demand, such as Gauteng, receive less water than they need. Most rain falls in a narrow belt along the eastern and southern coasts. The rest of the country receives only 27% of South Africa's total rainfall. In addition, hot dry conditions result in a high evaporation rate.

Water is thus a very scarce resource in South Africa.

In support of learning and teaching about water and water-related issues, the Water Research Commission of South Africa and Share-Net (a project of the Wildlife and Environment Society of South Africa) have developed a series of lesson plans on water. These lesson plan packs, from Grade R to Grade 10, are linked to the South African National Curriculum.

Each pack contains five lessons, with each lesson focusing on a different learning area – these can either be used as they are, or adapted to suit the local context. Each lesson is concluded with a rubric of criteria to assess the learners. Learning Outcomes and Assessments Standards covered during each lesson are given in the summary at the beginning of the pack.

Did you know?

- the Northern Cape receives very little rain and many of the people living there rely on groundwater;
- the Western Cape, south western Cape and KwaZulu-Natal are areas with many RAMSAR wetland sites;
- the Free State is home to one of the most important river catchment areas in the country.

Use the map on the following page to, wherever possible, contextualise your lesson plans – in other words, if you live in the Northern Cape, bring groundwater and evaporation issues into your lessons, if you teach in KwaZulu-Natal or the Western Cape, wetlands could form the focus areas of your teaching lessons.

All these lesson plan packs are available on www.envirolearn.org.za Other useful websites are the Water Research Commission's website www.wrc.org.za and the Wildlife and Environment Society of South Africa's website www.wessa.org.za

WESSA

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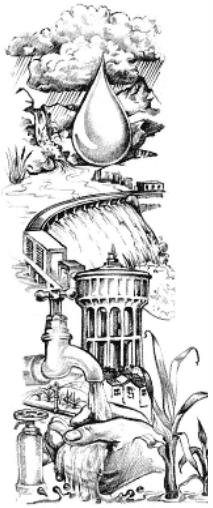
WATER IN SOUTH AFRICA



LIMPOPO
Limpopo is in the savanna biome, an area of mixed grassland and trees generally known as bushveld. A summer-rainfall region, the northern and eastern areas are subtropical with hot and humid summers and mist in the mountains. The bushveld is cattle country, where extensive ranching operations are often supplemented by controlled hunting. Sunflowers, cotton, maize and peanuts are cultivated in the Bela-Bela and Modimole areas. Tropical fruit, such as bananas, litchis, pineapples, mangoes and pawpaws, as well as a variety of nuts, are grown in the Tzaneen and Makhado areas. Tzaneen is also at the centre of extensive tea and coffee plantations.

LIMPOPO

GAUTENG
Rain does not always fall where it is most needed, and areas of high demand, such as Gauteng, receive less water than they need. Using several small rivers along the way, water moves from the Katse Dam in Lesotho to the Ash River that flows into the Vaal to supply industry and people in Gauteng.

GAUTENG

Johannesburg
800mm/year

MPUMALANGA
The province is a summer-rainfall area. An abundance of citrus and many other subtropical fruit as well as nuts and a variety of vegetables are produced in Mpumalanga. Nelspruit is the second-largest citrus-producing area in South Africa and is responsible for one third of the country's export in oranges. The Institute for Tropical and Subtropical Crops is located in the city.

NORTHERN CAPE
Huge areas of our country have few people living there because it is so dry. People must depend on water from boreholes that suck up water trapped by underground rock formations beneath the soil surface. We have about 30 000 billion litres of water underground. In some areas, groundwater is replenished by rainfall, but in many places the water is left from ages past when the climate was wetter. This water is called fossil water and once used, cannot be replaced.

FREE STATE

FREE STATE
Bloemfontein is the Afrikaans word for 'fountain of flowers'. It originated as a resting point for oxen next to a spring where water could always be found.
The Free State is home to one of the most important river catchment areas in South Africa, with more than 50% of the water supply for the country coming from the upper catchment area of the Little Caledon River.

KWAZULU-NATAL

Port Nolloth receives only
58 mm of rain per year!

NORTHERN CAPE

Durban 1100 mm/year

EVAPORATION
Why is the west coast so dry? Water that evaporates from the Atlantic Ocean condenses to form thick mists over the cold sea. But when these mists move in over the hot land, the water evaporates again instead of falling as rain.

KWAZULU-NATAL
The eastern part of country receives more rain than the rest of the country. It also has many RAMSAR wetland sites in the northern part of the province. Health and sanitation related to water-borne diseases, such as cholera, are serious issues for this region.

WESTERN CAPE
The Western Cape, unlike the rest of the country, receives its rain during the winter months. There are many important RAMSAR wetland sites in this part of the country.

East London
1400 mm/year

EASTERN CAPE

WESTERN CAPE

Indian Ocean

EASTERN CAPE
The province's diverse climates and landscapes range from the dry and desolate Great Karoo to the lush forests of the Wild Coast and the Keiskamma Valley, the fertile Langkloof, renowned for its rich apple harvests, and the mountainous southern Drakensberg region around the town of Elliot.

Cape Town
600 mm/year

Atlantic Ocean

Water, water, water!!

Share-Net

This pack supports an introduction for young learners to an Eco-School's focus on resource management

Grade R

This pack contains:

Activity One: This listening, answering questions and colouring-in **LANGUAGES** activity introduces young learners to water, by way of a very special creature, the otter. It encourages them to discuss and share ways that water is used in their lives.

Activity Two: A **NATURAL SCIENCES** activity that introduces learners to two of the three phases of water – liquids and solids. By following your simple verbal instructions, each child can make their own set of musical water bells, perhaps even compose a tune or two! They can then pop one of their water bell containers into the freezer to see water changing from one form (a liquid) to another (a solid).

Activity Three: Following on from Activity One and Activity Two, learners dance, move and shake in this **ARTS AND CULTURE** lesson! They will need to draw on the earlier discussions and activities around water, their own personal experiences and their imaginations!

Activity Four: Making and racing small boats is great fun. This **TECHNOLOGY** lesson encourages learners to think about what materials they would like to choose for their boat, to listen and follow instructions and to speak about their designs.

Activity Five: Just for fun – some wet, damp and rainy poems and rhymes.

WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10 which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031. (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

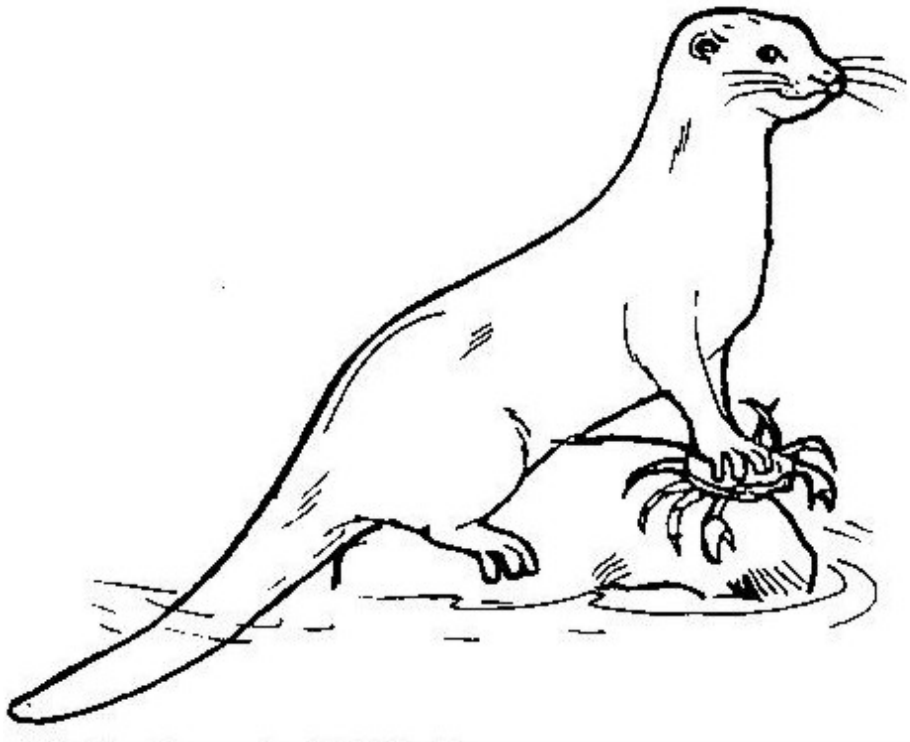
Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. Listening, answering questions and colouring in.	Languages	**Learning Outcome 1:** Listening: The learner will be able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations. **Learning Outcome 2:** Speaking: The learner will be able to communicate confidently and effectively in spoken language in a wide range of situations. **Learning Outcome 4:** Writing: The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.	• Demonstrates appropriate listening behaviour by listening without interrupting, showing respect for the speaker, and taking turns to speak. • Participates confidently and fluently in a group. • Recounts own personal experiences. • Experiments with writing: manipulates writing tools like crayons and pencils. • Copies print from the environment.
2. Introduction to two of the three phases of water (liquid and solid).	Natural Sciences	**Learning Outcome 1:** Scientific Investigation: The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.	**Does:** Participates in planned activity: • Follows simple instructions with assistance. • Explains what is being done. **Reviews:** Thinks and talks about what has been done. • Uses simple words, pictures or other items with assistance to explain what has been done.
3. Drama exercise, drawing on previous two activities, personal experience and imagination.	Arts and Culture	**Learning Outcome 1:** Creating, Interpreting and Presenting: The learner will be able to create, interpret and present work in each of the art forms. **Learning Outcome 2:** Reflecting: The learner is able to reflect critically and creatively on artistic and cultural processes, products and styles in past and present contexts. **Learning Outcome 3:** Participating and collaborating: The learner will be able to demonstrate personal and interpersonal skills through individual and group participation in Arts and Culture activities.	**Dance:** • Through play, co-ordinates simple gross and fine motor movements, including crossing the mid-line. **Dance:** • Talks about own dancing using action words. **Drama:** • Thinks about and shows how people and animals move. **Dance:** • Responds to movement instructions that cover space without bumping or hurting others when moving backwards and forwards.
4. Designing and building simple boats by following instructions and choosing between a range of materials.	Technology	**Learning Outcome 1:** The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.	**Designs:** • Chooses from a given range, materials or substances that can be used to make simple products. **Makes:** • Makes simple products from a range of materials provided. **Evaluates:** • Expresses own feeling about the products made.
5. Just for fun - water and water-related poems and rhymes.	-	-	-

ACTIVITY ONE: LISTENING, ANSWERING QUESTIONS AND COLOURING IN

This listening, answering questions and colouring-in LANGUAGES activity introduces young learners to water, by way of a very special creature, the otter. It encourages them to discuss and share ways that water is used in their lives.

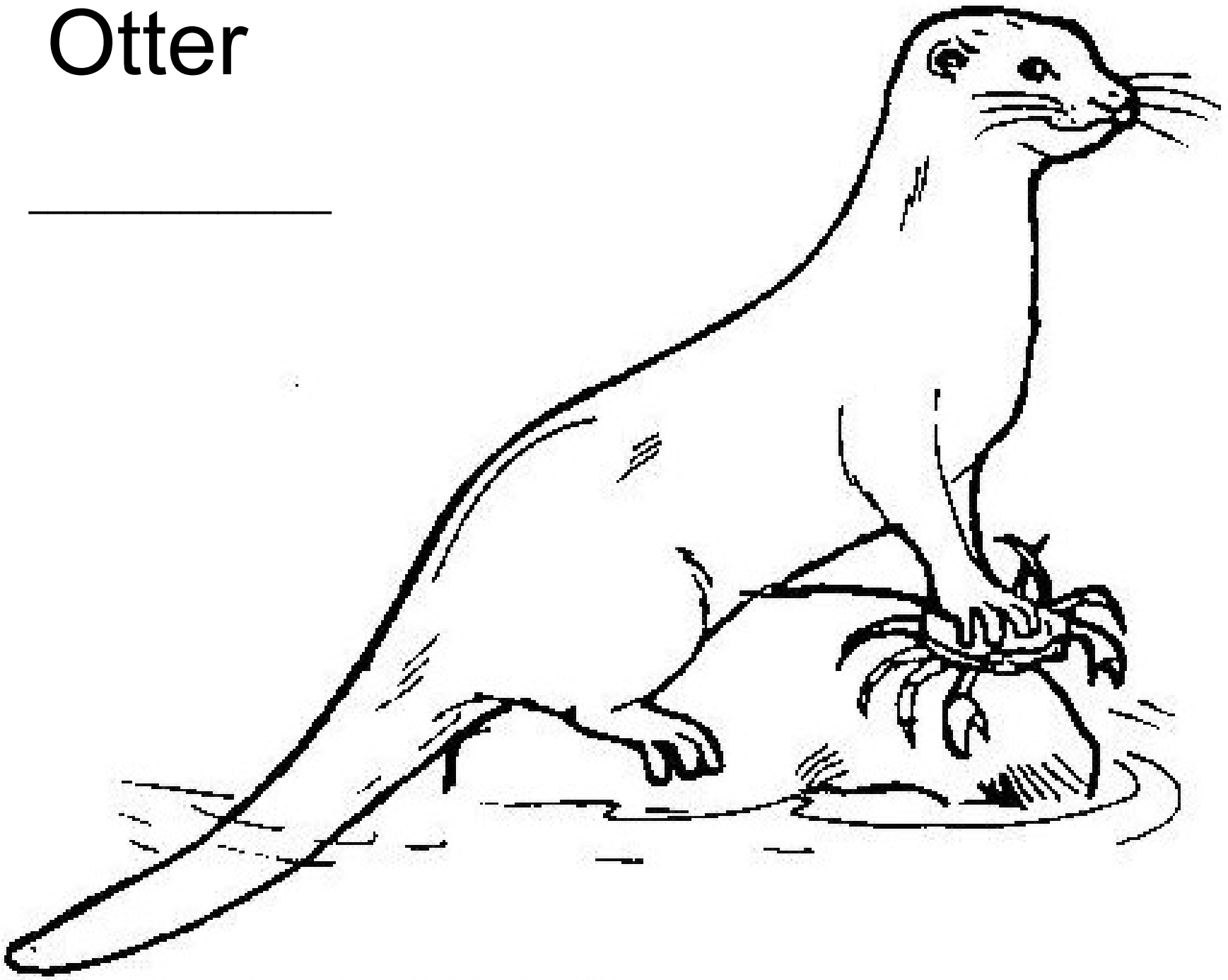
READ THE FOLLOWING STORY TO YOUR CLASS:

Otters live in and around mountain rivers and quiet freshwater pools. If you are very lucky, you will see them! Most people don't see otters because they are very shy animals. They spend most of their time in or near water, where they play with one another, catch fish and clean their thick fur. They use their paws and nose to catch and eat crabs, fish, frogs, snails and even water-birds. To dry their fur after swimming, they sun themselves on rocks and sandbanks. They can swim under water for a long time by closing their ears and nostrils and they use their paws like flippers. They also use their tails to swim and it makes them sway from side to side in the water.



Otter

_____



Otter

Questions:

1. What was this story about?

2. Where do otters spend most of their time?

3. Have any of you seen an otter?

4. What was the otter doing?

   If no-one has seen an otter, find out what other creatures the children have seen in and around water (crabs, fish, insects, water-birds) and what the animals were doing.

5. What is the otter in the picture doing? (use the enlarged A4 picture on page 2).

6. What other animals can you think of that spend most or all of their time in water? *(Fish, water birds, insects, crabs)*

7. Who is like an otter in this class and likes swimming? (Get responses from the whole class).

8. Who, like the otter, can swim under water?

You won't ever see an otter where there is no water – otters have to have water in their lives. And so do we!!

Ask everyone to think of two ways they use water each day (examples include washing clothes, showering, bathing and drinking). Going round the class, you can write a list up on the board.

Can anyone think of a day when they didn't make use of any water (remind the children that fruit juices and cooldrinks also contain water, their midday and evening meals will probably also make use of water [boiling potatoes, cooking rice], mothers wash their clothes which also makes use of water).

All learners can colour in the "Cape Clawless Otter" brown except for a white throat and chest. For a more challenging exercise and for the more adventurous learners, there is a join-the-dots exercise as well. Learners can also copy the text "Otter" onto the line drawn.

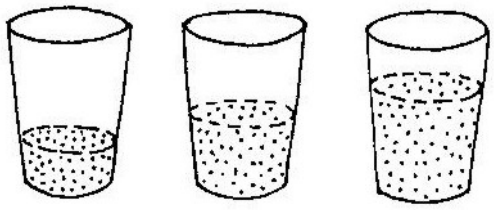
Criteria to assess learners during this languages lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner listened attentively to the story without interrupting the teacher				
The learner participated confidently and fluently in a group when questions about the otter were asked				
The learner recounted own personal experiences of water				
The learner copied the word "Otter"				
The learner used crayons and pencils with confidence and appropriately				

ACTIVITY TWO: MAKING WATER BELLS

The following NATURAL SCIENCES activity introduces learners to two of the three phases of water – liquids and solids. By following your simple verbal instructions, each child can make their own set of musical water bells, perhaps even compose a tune or two! They can then pop one of their water bell containers into the freezer to see water changing from one form (a liquid) to another (a solid).

Water bells are easy to make and fun to use. They are good for playing tunes and for making up your own songs! They also give learners the opportunity of pouring and playing with water in its liquid form.



What you will need for each learner:

- Three glass containers (drinking glasses or bottles)
- Large plastic jug of water (add food colouring for interest)
- Wooden pencil

1. Let the learners pour water into each container. They must pour different amounts of water into each container (see picture above). This will change the sound they get when they hit the glass or container with the pencil.
2. Allow learners to experiment with pouring and hitting the containers until they have three different sounds. Can they make up a "water tune" of their own?

Either during this activity or as a class, ask the children what they are doing? Let them show you how different amounts of water in each glass container make a different sound when they hit the glass.

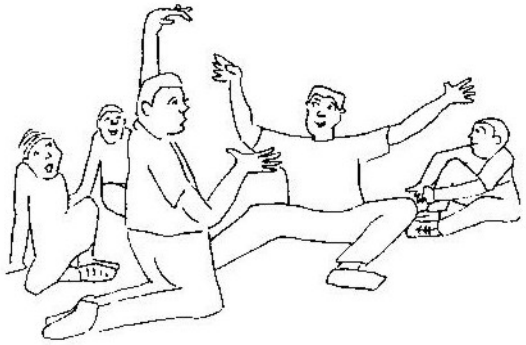
After this activity, you may like to put some of the glasses into a freezer to show the learners that water can occur in a number of forms by changing its form when frozen or heated. If you have a freezer in the staff room, place some half filled containers in it the day before this activity. Show the children the ice (if possible, give each child an ice cube to play with). They will see that it quickly melts in hot hands!! Some may even chose to suck on the ice cube and see how quickly it melts in their mouths.

Criteria to assess learners during this natural sciences lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner was able to follow simple instructions				
The learner was able to explain what he/she was doing				

ACTIVITY THREE: DANCING, MOVING, SHAKING

Following on from Activity One and Activity Two, learners dance, move and shake in this ARTS AND CULTURE lesson! They will need to draw on the earlier discussions and activities around water, their own personal experiences and their imaginations!

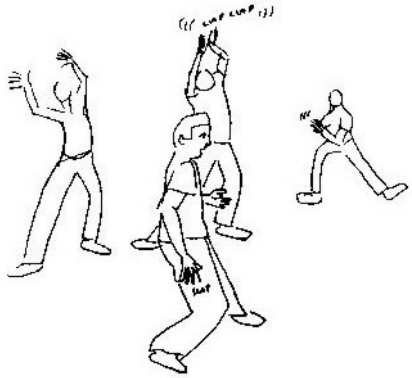


Create a physical space that encourages participation. If you are in a classroom, clear the desks and chairs to the side to create an open space. Make sure there is place for everyone to move or sit in a circle.

Warming Up

It is a good idea to take the class through some warm-up activities. Warming up in drama is more than just a physical warm-up, it also helps to build a group spirit and encourages the learners to focus (if they are too active it helps calm them down, if they seem lethargic and lazy, it will help you to energize them!!)

Warming Up 1: Walking around the space



1. Everyone in the class should walk around the space that you have created. Each child can walk in any direction they like and change direction as often as they want to. However, they must be careful not to bump into other learners.
2. Each time you clap your hands, the learners must change direction.

Warming Up 2: A physical shake-up

1. The class stands in a circle, facing each other. (You may like to stand in the centre of the circle to demonstrate your instructions).
2. They must imagine there is a big bowl of water right in front of them.
3. Everyone in the circle should stick their fingers into their imaginary bowls.
4. The learners must bring their fingers out of the water and flick and shake all the water off. Flick it up to the ceiling … and down to the ground… and to the left … and to the right.
5. Next, learners put their hands into their imaginary bowl of water, up to the wrists. Again, as they bring them out, shake the water all over … now their wrists are being shaken and their fingers are being shaken.
6. Then they need to put their arms into the imaginary water, up to the elbows … and bring them out … and shake … elbows, wrists and fingers.
7. Keep going … adding the shoulders… then the left leg … then the right leg … until eventually the children jump into the imaginary bowl of water, covering their whole body with water and when they jump out, they shake their whole body! An invigorating way for the children to loosen up!

Now that the children have done a couple of warm-up activities, read out the following instructions. If you need to demonstrate first, read the instruction and then demonstrate but try to encourage the children to be creative and let them know that they can make a contribution to the drama without being laughed at.

- Drink a glass of water
- Brush your teeth
- Wash your face
- Have a shower
- Wash a car or a bicycle
- Wash the dog!!
- Catch a fish in a net!

- You are walking on ice – it's slippery and you have to make sure you don't fall or bump into anyone else
- Put your skating boots on - remember to tie the laces tightly!
- Skate on ice
- Swim across a river
- Jump from one puddle to another puddle
- Do you remember the otter from the earlier lesson? Ask the children to swim like an otter would – from side to side – playing in the water, catching a crab or a fish.

Now, with everyone sitting in a circle, ask the learners what they enjoyed the most (you may need to remind them by going through the list above). Let them describe one or two actions that they enjoyed.

Criteria to assess learners during this arts and culture lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
Responded to movement instructions				
Did not bump into other learners				
Crossed the mid-line during the drama activities				
Talked about own dancing using action words				

ACTIVITY FOUR: BOAT BUILDING AND RACING!

Making and racing small boats is great fun. This TECHNOLOGY lesson encourages learners to think about what materials they would like to chose for their boat, to listen and follow instructions and to speak about their designs.

You will need:

- Pieces of polystyrene (about 10cm by 20cm)
- Bark
- Leaves
- Polystyrene egg containers
- Wooden kebab sticks
- Pieces of white card for 'sails' (about 10cm by 10cm)
- Crayons for the learners to colour in their 'sails'

The children can decide what materials they will need and chose what kind of boat they want to make, be it a natural 'leaf and bark' boat or a polystyrene egg carton cargo carrier.

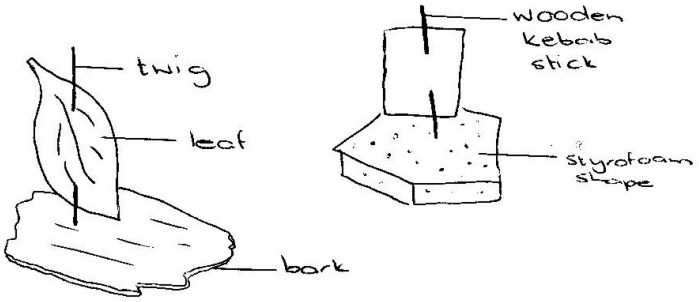
For fun, you could buy a packet of jelly babies and the children could have 'passengers' in their hand-made boats.

Once all boats have been completed, ask the children how they feel about their boats. What made them chose what they did, do they think they have built a strong boat, why do they like their particular boat?

After this boat building exercise, you could organise a fun 'boat race day' if the school is near a small stream or river.

Please remember that if your class is going to sail their boats where they are unable to retrieve them, then make them from natural materials so as not to harm the environment.

Happy boat building!!



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Criteria to assess learners during this technology lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
Learner was able to chose materials to make his/her boat				
Learner followed instructions of teacher and made simple boat				
Learner spoke about his/her boat				

ACTIVITY FIVE: JUST FOR FUN – SOME WET, DAMP, RAINY POEMS AND RHYMES

Puddles
When the rain is coming down
In the puddles I splash around
The water's wet, but I am dry
I have my boots on, that is why!

Rain
Two ducks went waddling down the lane
Said one to the other, "What beautiful rain!"
Two children came to the door with a frown
Said they "What a pity, it's pouring down!"
And old Mr Weather scratched his head
"You can't please everyone!" he said.

Five Little Speckled Frogs
Five little speckled frogs
Sat on a speckled log
Catching the most delicious bugs – yum, yum
One jumped into the pool
Where it was nice and cool
Then, there were four little speckled frogs,
Quark, quark

Four little speckled frogs … Repeat until … there are no little speckled frogs!

1-2-3-4-5 Once I Caught a Fish Alive
1-2-3-4-5 Once I caught a fish alive
6-7-8-9-10 Then I let him go again.
Why did you let him go?
Because he bit my finger so!
Which finger did he bite?
This little finger on my right.

I Hear Thunder
I hear thunder, I hear thunder
Hark don't you? Hark don't you?
Pitter patter raindrops
Pitter patter raindrops
I'm wet though, I'm wet through!

Water in my life

Share-Net

This pack supports an introduction for young learners to an Eco-School's focus on health and safety

Grade 1

This pack contains:

Activity One: A listening and group work **LANGUAGES** activity looking at freshwater in our lives. Using a simple demonstration, the teacher is easily able to show learners how limited our freshwater resources are and allow the children to consider ways that water can be conserved.

Activity Two: This **LANGUAGES** activity introduces the concept of 'catchments'. It looks at water sources and encourages learners to consider how we can protect and care for them.

Activity Three: This **LIFE ORIENTATION** lesson looks at basic sanitation and when and why we need to wash our hands.

Activity Four: This **TECHNOLOGY** activity follows on from the earlier lesson on basic sanitation. Learners use materials gathered from home and around the school to make their own toilet hand washer.

Activity Five: Just for fun!! Making an indoor rainbow.

WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10 which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031 (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. Listening and group work activity looking at freshwater. A simple demonstration by the teacher shows learners how limited our freshwater resources are. A homework worksheet is also included in this activity.	Languages	**Learning Outcome 1:** Listening: The learner will be able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations. **Learning Outcome 2:** Speaking: The learner will be able to communicate confidently and effectively in spoken language in a wide range of situations.	• Listens attentively to instructions and announcements and responds appropriately. • Demonstrates appropriate listening behaviour by listening without interrupting, showing respect for the speaker, taking turns to speak and asking questions for clarification. • Talks about personal experiences, feelings and news. • Contributes to class and group discussions.
2. Introduction to the idea of a 'catchment'. This activity looks at water sources and encourages learners to consider how we can protect and care for them.	Languages	**Learning Outcome 1:** Listening: The learner will be able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations. **Learning Outcome 2:** Speaking: The learner will be able to communicate confidently and effectively in spoken language in a wide range of situations.	• Listens attentively to instructions and announcements and responds appropriately. • Demonstrates appropriate listening behaviour by listening without interrupting, showing respect for the speaker, taking turns to speak and asking questions for clarification. • Talks about personal experiences, feelings and news.
3. This activity looks at basic sanitation – when and why does one wash one's hands?	Life Orientation	**Learning Outcome 1:** Health Promotion: The learner will be able to make informed decisions regarding personal, community and environmental health. **Learning Outcome 2:** Social Development: The learner will be able to demonstrate an understanding of and commitment to constitutional rights and responsibilities, and to show an understanding of diverse cultures and religions.	• Explains steps to ensure personal hygiene and links these steps to environmental health. • Distinguishes between situations that are safe and those that require precautions against communicable diseases. • The learner draws up classroom rules.
4. This lesson follows on from the earlier one on sanitation and learners make their own toilet hand washer.	Technology	**Learning Outcome 1:** Technological Processes and Skills: The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.	• Designs: Chooses suitable materials or substances to make simple products to satisfy a given need. • Makes: Makes simple products from different materials. • Evaluates: Expresses and explains own feeling about the products made.
5. Just for fun – making an indoor rainbow.	-	-	-

ACTIVITY ONE: WATER IN OUR LIVES

This listening and group work LANGUAGES activity looks at freshwater in our lives. Using a simple demonstration the teacher is easily able to show learners how limited our freshwater resources are and allow the children to consider ways that they can conserve water. The worksheet provided can either be used as a consolidation of the ways we use water in our daily lives, or as a homework activity.

Everyone has a birthday, don't they? Mine is on the 3 November! I wonder when yours is. Did you know that WATER has a special day as well? It's 22 March and it's called World Day for Water[1]. It's not really a birthday, but it's a day when people all over the world remember how important water is in our lives.

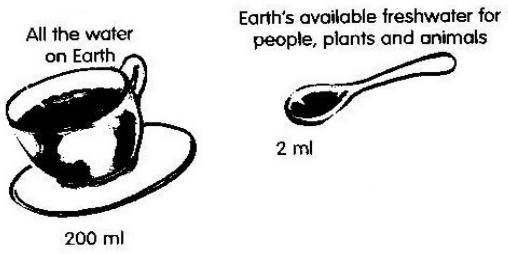
In South Africa, we're very lucky because our government knows how important freshwater is to all South Africans and they have decided to make the week[2] that includes 22 March, National Water Week – that's a whole week dedicated to thinking, talking and doing lots of active things about and for water!

Our country is very rich in gold and diamonds but it is very poor in freshwater. A few parts of South Africa get lots of rainfall but there are many many towns and villages in the western part of the country that receive very little rain throughout the year. Whether we live in towns, cities or on farms where we get lots of rain, or in places where there is very little rain, freshwater is essential to all of us – for our lives and our good health.

Although there are many oceans and seas covering our Earth, we have to remember that all that water is salt water, not freshwater. Only a very small amount of all the water that we find on Earth is freshwater, which we can drink.

A demonstration for you, the teacher, to show the learners how little freshwater there is on the planet for our daily needs

Fill a teacup with water (200 ml) – this represents all the water on Earth. Now take out just less than half a teaspoon (2 ml) – these 20 drops of water represent the amount of freshwater available for use by all the people, animals and plants on the Earth! Whew, that's not very much, is it? Water is precious – so, let's make sure that none of us waste a drop.



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We use water in many ways - for drinking, for washing our bodies, for cleaning our homes, for preparing and growing food and for our livestock and pets.

ACTIVITY:

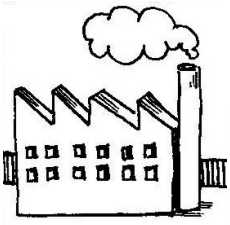
- In groups of four or five, think and talk about all the different ways you use water every day. Each person in the group will need to report back to the rest of the class.

One can see from all the report backs that there are so many different ways, each day, that we use water in our lives. Using the worksheet that follows (either during the lesson or as a homework exercise), learners will be able to consolidate and think about other ways that freshwater plays a role in their lives.

Water in our lives

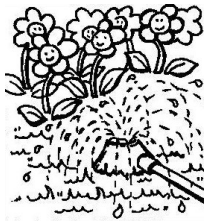
Draw a line from the words on the right to the pictures on the left

Swimming

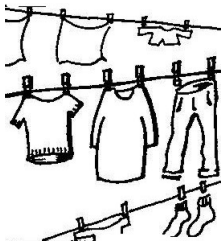


Washing clothes

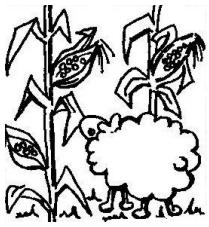
Watering vegetables



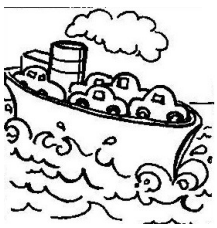
Transport



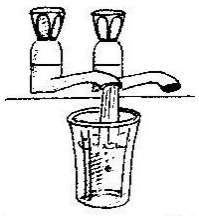
Cooking



Drinking



Watering flowers



Factories

ACTIVITY:

- In the same groups, let the children think and discuss ways that they can save water.

Some ideas to get the children thinking ….

- Don't leave a tap running
- Fix leaking taps
- Put the plug in when washing dishes or vegetables.
- Greywater (that is, water used for washing dishes, bath water or the washing machine) can easily be diverted into the garden
- Plant indigenous trees and bushes – they don't need as much water as plants that are not South African
- Boil just the amount of water you need when making a cup of tea or coffee
- Turn the tap off when brushing teeth or washing hands
- Collect rainwater for watering plants
- Use a bucket to wash the car or one's bicycle rather than a hosepipe

Once again, each learner in the group will need to clearly report back to the rest of the class what they spoke about within their group. The rest of the class is encouraged to ask each group questions about their water saving ideas.

It may be a good idea to write all the ideas on the chalkboard.

- Finally, from the list that is drawn up on the chalkboard, let the children decide which actions they can take to reduce their water use. Let them chose a simple one (such as making sure that the tap is not running when they wash their hands or brush their teeth) and see, through the week that follows, if they manage to remember this environmental action. You may even chose to conduct this activity during National Water Week, held in March each year.

Criteria to assess learners during this languages lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner listened attentively to the information on water without interrupting the teacher				
The learner listened attentively to the instructions and responded appropriately				
The learner was able to talk about their personal experiences of using water				
The learner was able to report back to the rest of the class				
The learner participated confidently and fluently in a group during discussions about water use and water saving				

For the teacher's interest:

1 *World Day for Water was declared an international day in 1992 by the United Nations General Assembly and was first celebrated in 1993. It was suggested that the day be observed in conformity with the recommendations of the United Nations Conference on Environment and Development (UNCED) contained in Chapter 18 of Agenda 21. The theme for World Day for Water 2007 is 'Coping with water scarcity'.*

2 *For more information on National Water Week or World Day for Water, contact the Department of Water Affairs and Forestry, Private Bag X313, Pretoria, 0001. Tel: 012 336 8250. Toll free number: 0800 200 200. Useful websites are: www.worldwaterday.org; www.dwaf.gov.za and www.unesco.org/water/water_celebrations/*

ACTIVITY TWO: WHERE DOES OUR WATER SUPPLY COME FROM?

This LANGUAGES activity introduces the concept of 'catchments' and that every single one of us lives within a catchment. It also looks at water sources and encourages learners to consider how we can protect and care for them.

Everyone lives in a catchment. A catchment is the area of land that collects the rain for one main river and all the streams and other rivers that flow into it. Each river has its own catchment and different catchments are separated by mountains or hills.

One catchment catches all the rain that feeds one river

Water is essential for all of us. We drink it every day, we use it for cooking, washing, cleaning our bodies, watering plants and vegetables, flushing the toilet and many other things. It is essential for our good health and it is very important that we only drink water that is clean.

Where does all the water we use come from?

Ground water. When water falls to the Earth as rain, some of the water is slowed down by plants and grass and slowly sinks into the ground. It is cleaned as it passes through the soil and some of it may end up in an aquifer. An aquifer is a natural rock formation that acts as a sponge to store water underground. Groundwater can collect in huge underground lakes and some water has been in these lakes for many years. When the groundwater comes to the surface, it forms springs, wetlands or lakes. Did you know that most of the world's freshwater is actually underground!!

Springs. Groundwater sometimes bubbles to the surface as a spring. Springs provide us with clean water so we must make sure that they are protected and carefully looked after. Imagine how muddy and dirty the water would be if we let a herd of cattle trample over a spring!

Wells. If the underground water is close to the surface, it can be reached by digging a hole. This is often done in dry river beds. The water in the well can be brought to the surface using a bucket on a rope. People who collect water from wells must make sure the bucket and rope are clean otherwise they will dirty the rest of the underground water.

Boreholes. Sometimes groundwater is very deep or the ground is very hard and so the water can only be reached by using a machine and drilling a hole into the ground. These deep wells are called boreholes. Water is brought to the surface by a pump.

Rainwater harvesting. Where there is no groundwater, or if it is very dirty and not good to drink, collecting rainwater is another way we can get water. The rainwater can be collected off the roof of a house or school building by using gutters and tanks.

Dams. They store river water which can be used for crops, industries and our own homes.

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After reading the information above to your class, ask the learners the following questions:

1. Do you know where the water you drink at home comes from?
2. How do people that live near you get their water?
3. Do you think the water that you drink is clean?
4. How do you know?
5. Do any of you live on a farm where you get your water from a river or borehole?
6. What does the water taste like?
7. How many of you have been swimming or sailing or even fishing on a big dam?
8. Did you know that many people will use that water for drinking?
9. Have you seen any rivers or streams or ponds that are very dirty?
10. What did you see?
11. Did you see many plants, animals or insects in the dirty river/stream/pond?
12. Have you seen any rivers or streams or ponds that are very clean?
13. What did you see?
14. Did you see any plants, animals and insects in the clean river/stream/pond?

In the previous lesson, the class explored ways in which water could be saved. It is also very important that the learners consider how to protect and care for the water sources that supply the very water they use each day.

15. What can we do to care for dams, rivers, ponds and streams and even the sea and the beach, when we go fishing, sailing or swimming?

Question 15 should encourage learners to think about how they enjoy many water sources, such as dams and rivers, and how they can make sure that their individual actions do not contribute towards polluting water sources (such as not leaving litter, both near a water source and in the water source, after a picnic or fishing tackle after a fishing expedition with the family).

Depending on your group, the discussion that may arise from Question 15 could lead the class into taking some environmental action such as a river or stream clean-up, or adopting a river and keeping it free of invasive, alien plants. Even if Question 15 does not lead to any class or group environmental action, it should leave the learners knowing that, as individuals, they CAN all make a difference and that their individual actions are very important in keeping our water sources clean.

Criteria to assess learners during this languages lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner listened to the questions and responded appropriately				
The learner listened to the exercise on water sources without interrupting the teacher				
The learner was able to share his/her personal experiences of water sources				
The learner was able to offer solutions and/or comments about their environmental actions when enjoying fun activities near or around a water source (question 15)				

ACTIVITY THREE: WATER, SANITATION AND HEALTH

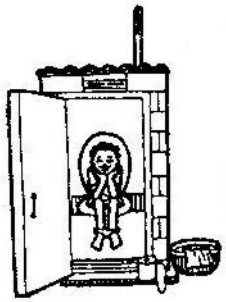
This LIFE ORIENTATION activity looks at basic sanitation – when and why should we wash our hands?

Most of us have different names, we live in different houses, if we were to write our addresses or our telephone numbers, they would all be different; some of us like polony on our bread and some of us don't; some of us have brothers and sisters and some of us don't; some of us have pets; some of us live in towns, others live on farms or in small villages. So, it seems like there are quite a few things that make us different from each other BUT there are many many things that make us similar. We all need to eat food or else we'll get very very hungry and then get sick and we all need to drink fresh clean water. We also ALL need to go to the toilet every day!!

The food and water that we eat and drink makes our bodies strong and our brains clear and bright. If our bodies don't need all the food and water that we feed them, they need to get rid of it and one of the ways they do that is when we go to the toilet.

CLASS DISCUSSION:

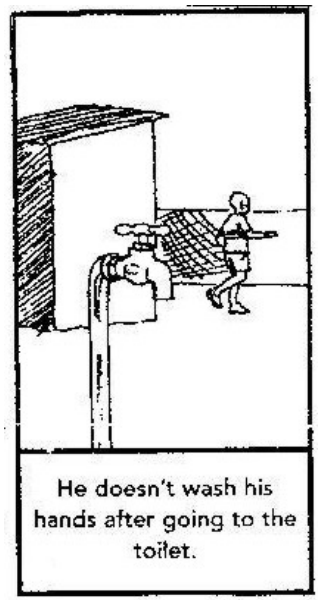
- As a class, let the children discuss different kinds of toilets that they have seen. They may like to draw pictures of the toilets they know – these could include flush toilets, pit latrines (of which there are many different types), 'eastern toilets' (also flush toilets but with no seat), commodes and buckets. There may even be mention of people using the bush or a tree as a toilet.



Germs are living things but they are so small, you can't see them. You have to use a microscope. You get good germs and bad germs and the ones that you can get on your hands after you've been to the toilet or helped your mother change the baby's nappy, are BAD germs. They can make you very sick if they get back into your mouth and then into your tummy.

Photocopy the two comic strip stories on the next page or if you have access to an overhead projector, photocopy the stories onto an overhead transparency.

This child has worms.



He doesn't wash his hands after going to the toilet.

His hands are covered in worm eggs that he can't see.

He gives his friend a biscuit. The biscuit is covered in worm eggs from his dirty hands.

The friend eats the biscuit covered in worms eggs.

The friend develops worms.

After going to the toilet

... Nathi does not wash his hands

He meets Tsepang and shakes hands

Tsepang meets Sizwe and shakes his hand

Nathi, Tsepang and Sizwe meet many friends and the germs are passed on to all of them

Soon everyone is suffering from diarrhoea

QUESTIONS TO ASK THE CLASS:

1. After going through the comic strips, ask the learners, in groups of four or five to discuss the two 'stories' amongst themselves. They need to be able to talk through the pictures with words / a story.

2. Ask the children how they felt at the end of the story.

3. Have any of the children ever had diarrhoea (a runny sore tummy)? Let them know that sometimes a sore runny tummy can also be caused by eating food that is not fresh.

4. What should Nathi and the child in the comic strip have done, after going to the toilet?

5. When should we wash our hands?

   Some answers:
   - After going to the toilet
   - After touching animals
   - After handling old food or taking the garbage outside
   - After changing babies' nappies
   - After cleaning
   - Before we eat
   - Before we start working with food

6. Why should we wash our hands? *(remember to link this back to the two comic strips)*

7. In their groups, let the children think about and discuss rules for when they should wash their hands. Each group needs to come up with as many rules as there are learners in the group – in other words, if there are five children in a group, there will need to be five rules for that group. Each child can then report back to the rest of the class the rule that he/she contributed during the group discussion. These can be written onto the board by the teacher.

Criteria to assess learners during this life orientation lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner was able to describe what happened in the comic strip				
The learner was able to answer the question of why hands should be washed in relation to germs/getting sick				
The learner was able to contribute at least one rule about when he/she should wash his/her hands				

ACTIVITY FOUR: CLEAN HANDS!
MAKING A HAND WASHER

This TECHNOLOGY lesson follows on from the earlier lesson on basic sanitation. Learners use materials gathered from home and around the school to make their own toilet hand washer.

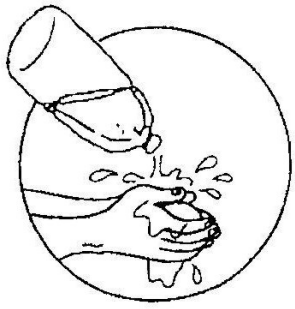
Making a hand washer

Start collecting different plastic bottles (preferably with 'clip fast' nozzles) about a week before you start the activity. Ask the learners to assist with the collection of bottles from home.

The class can either be divided into groups of four or five learners or, if you have enough bottles (and this is the best option!), the learners can make individual bottle hand washers and then take them home.

Some bottles that have been used by many schools are those of the Energade, Powerade variation where the bottles have a 'clip fast' nozzle.

1. Add a teaspoon of liquid soap to each bottle and then fill with water.
2. Carefully tie string around the bottle so that it hangs in the correct position.
3. Hang a hand washer near the toilet for washing hands after using the toilet.
4. Hang another hand washer outside the classroom for hand washing before eating.



How to use your hand washer

Depending on the nozzle type of your bottle, it can be clipped and left open and squeezed to release water when needed. Some of the nozzles may need to be clipped shut to prevent losing water.

Soap?

If you don't have any liquid soap, 'shavings' from a bar of soap can be added to the water in the bottle.

Once all the hand washers (in all their different colours, shapes and sizes) have been made, ask each child to hold up his/her hand washer (or if it was a group effort, hold up the group's hand washer) and ask each child what they feel about their hand washer, could they make it better, does it look good, do they think it will be used, could they make another one on their own at home?

Remember that it is very important to wash your hands often.

Why a towel can be unhygienic?

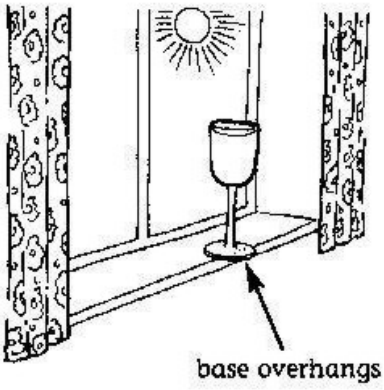
Most toilets and bathrooms provide a towel near the washbasins on which to dry your hands. This is, however, a very unhygienic practice as germs are wiped onto the towel, which remains damp, providing suitable conditions for the growing of bacteria. Rather have no towel and shake your hands dry.

Criteria to assess learners during this technology lesson

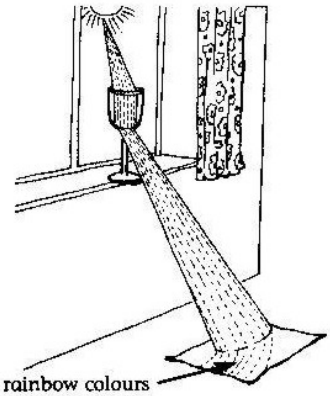
Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner was able to choose what he/she needed from all the materials that had been collected by both the teacher and the class				
The learner was able to use the available materials (bottle, string, scissors etc) to make a hand washer				
The learner was able to discuss his/her hand washer				

ACTIVITY FIVE: JUST FOR FUN

Make an indoor rainbow with your learners



1. Fill a wine glass with water and place it on a sunny windowsill while the sun is still high in the sky. Move the glass so that the base slightly overhangs the edge of the windowsill.



2. Now take an A4 sheet of white paper and hold it up near the base of the glass so that the light shines through the glass and onto the paper. Keeping the light on the paper, move it away and down towards the floor. Once you get far enough away, the white light splits into the seven colours of a rainbow.

How it works: A rainbow is created when light travels through water. The water bends the light so that it splits into the 7 colours of the rainbow – red, orange, yellow, green, blue, indigo and violet.

Water all around me

Share-Net

This pack supports an introduction for young learners to an Eco-School's focus on health and safety

Grade 2

This pack contains:

Activity One: A listening and writing **LANGUAGES** activity that looks at the water cycle. It follows the adventures of Drip the Drop who starts his journey in the sea, goes on an amazing adventure, and eventually returns back to the ocean, only to start his adventure again!

Activity Two: An **ARTS AND CULTURE** activity which follows on from the story of the water cycle in Activity One. Learners have fun expressing the story in different ways of movement.

Activity Three: This **NATURAL SCIENCES** activity is a fun way of looking at part of Drip the Drop's journey!

Activity Four: A **LIFE ORIENTATION** lesson which makes use of a fun comic story to encourage learners to discuss sources of clean and unclean water and simple water purification methods.

Activity Five: Just for fun – construct a mobile which will represent the different plants and animals found in the different levels in a pond or stream.

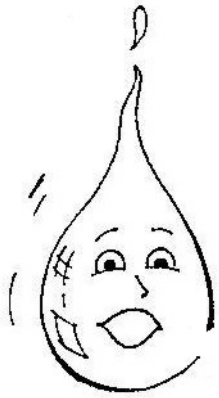
WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10 which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031 (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. A listening and writing activity looking at the water cycle. A homework colour-in water cycle picture is included.	Languages	**Learning Outcome 1:** Listening: The learner will be able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations. **Learning Outcome 4:** Writing: The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.	• Listens attentively for a longer period (with extended concentration span) and responds to an extended sequence of instructions. • Writes a simple story. • Writes a title that reflects the content. • Uses basic punctuation (capital letters and full stops). • Forms letters clearly and easily.
2. Using the "Drip the Drop" story, learners express the story in different physical ways.	Arts and Culture	**Learning Outcome 1:** Creating, Interpreting and Presenting: The learner will be able to create, interpret and present work in each of the art forms. **Learning Outcome 2:** Reflecting: The learner will be able to reflect critically and creatively on artistic and cultural processes, products and styles in past and present contexts.	**Dance:** • Accurately demonstrates the eight basic locomotor movements (walk, run, skip, hop, leap, jump, gallop, slide) while travelling forward, sideward, backward, diagonally and turning. **Drama:** • Plays at being characters and objects in stories based on local events or told by the teacher. **Drama:** • Expresses and describes feelings in response to a drama, story or event.
3. In groups or individually, learners make their own water cycle.	Natural Sciences	**Learning Outcome 1:** Scientific investigations: The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.	**Does:** • Participates in planned activity independently or as part of a group. **Reviews:** • Explains own contribution to the investigation. • Is curious about what might happen if the situation was changed in some way.
4. Using a comic story, learners discuss sources of clean and unclean water and simple water purification methods.	Life Orientation	**Learning Outcome 1:** Health promotion: The learner will be able to make informed decisions regarding personal, community and environmental health.	• Describes sources of clean and unclean water and simple water purification methods.
5. Learners construct a mobile which represents the different plants and animals found in the different levels of a pond or stream.	-	-	-

ACTIVITY ONE: WHERE DOES RAIN COME FROM?

This listening and writing LANGUAGES activity looks at the water cycle. It follows the adventures of Drip the Drop who starts his journey in the sea, goes on an amazing adventure, and eventually returns back to the ocean, only to start his adventure again!



READ THE FOLLOWING STORY TO YOUR CLASS:

From Sea to Sky

Far out at sea, Drip the Waterdrop floated with his friends. Drip rolled over slowly in the sunlit ocean. The warmer he got, the harder it was for him to stay still. “I feel jumpy”, he said.

Suddenly he was gone! Drip’s friends vanished too, they burst from the water’s surface and disappeared. They had ***evaporated.*** (*Do the children know what you mean when you say ‘evaporated’? Have any of them walked or driven through mist? It’s like walking through floating teeny tiny raindrops – that is what has happened to Drip).* Drip was now a misty, invisible vapour (teeny tiny, “too small to see”, water droplet) floating up to the sky. “I’m finally rid of that itchy salt” he said. “Who wants to be seawater anyway?”

No one answered Drip. His friends were rising too quickly. Winds carried Drip and his friends over the huge ocean towards the land. As he floated through the air, Drip gasped “What a view! But we are so high up in the sky! Those birds way down there look like tiny dots”.

As Drip floated over the land, more drops evaporated and joined him. “Hey, where did all of you come from?” Drip shouted. “I came from the salty sea”. “We came from the damp forests, lakes and rivers down below”, they all shouted back.

From Cloud to Rain

Soon the air got cooler and the droplets crowded closer together. They gathered so close that they formed a thick cloud. “Boy, it’s getting dark in here!” whispered Drip, a bit afraid. The air got even cooler. “I feel wet”, Drip murmured. He and his friends were **condensing**, or changing from mist into raindrops.

Kaboom! With a flash and a crash, lightning ripped through the clouds. The raindrops began falling. “Ummpff” groaned Drip as he splashed onto a rock and rolled onto the ground. “Now where are we going?” he asked some friends who had splashed down next to him. Nobody answered him because nobody knew.

From Stream to River

The water drops joined together and sped along as part of a tiny stream. They played games as the stream flowed through the grasses and rocks. “I’ve got you!! You’re on!” Drip shouted as he caught another drop. Instead of being *on,* though, the drop disappeared!! “Wait!” yelled Drip. “That’s not fair. Where did you go?”

But the drop *couldn’t* answer. It had soaked into the ground and was on its way to join millions of other drops in an underground lake. A short time later, Drip’s tiny stream joined another tiny stream to form a bigger one. This steam joined others until they all grew so big that they became one great, wide river.

The force of the flowing water amazed Drip. He and his friend held fast to each other as they bounced off the rocks, whipped around the bends, and splashed all over the place.

A Dirty Journey

After a long while, the river began to slow down. Drip drifted along, silent for once. Until …. “Oomph! What was that?” Drip cried as a floating object bumped into him. Looking about, he spied crushed cartons, bobbing cans and cups, and globs of tar all around him. “How did I get into this disgusting mess?” he wondered.

Drip edged away trying to find a cleaner place. Then all at once, everything went dark. “Oh no”, he moaned. Gushing from some pipes on the river’s edge was dirty water from a nearby town. And running into the river from the farms was a flood of mud! Drip and his friends moved blindly through this mess.

“If waterdrops had to breathe, we’d choke to death on all this rubbish and dirty water”, he complained to his friends. “Why do people allow this to happen? Don’t they care?”

As the river widened, more water flowed with Drip and his friends. More drops helped carry the dirty load downstream. Drip just missed being swallowed by an open bottle that was slowly sinking. In making his escape, he ran right into a large clump of water grass. Further along, more grass, reeds and other water plants spread out in a huge wetland. All the drops had to drift through it. When they got to the end of the wetland, they were much cleaner!

“Where did that disgusting junk go?” Drip asked. Then he realised that the leaves, stems and roots of the plants had trapped much of the rubbish, dirt and chemicals.

Back at Sea

Drip and his friends passed out of the wetland and into a large bay. Just as he looked to the horizon, he noticed a funny taste. It seemed familiar. Then he remembered and understood. “Well! What do you know! We’re back where we

started", Drip exclaimed as he and his friends rode the top of the big wave. "So, where do you think the sun and the wind will send us next time?" No one knew but wherever they were sent the next time round, it was sure to be a great adventure again!!

Writing Activities:

1. After reading the 'water cycle' story to your learners, get the children, either individually or in groups to discuss and write down an appropriate title for the story they have just heard. Each child then needs to share his or her title or group's title with the rest of the class.

2. Each child can now write a few lines on their own personal experience within the water cycle. They may like to write about what it felt like to be caught in the rain, or when they went swimming in a river/dam, or an outing to the beach/sea.

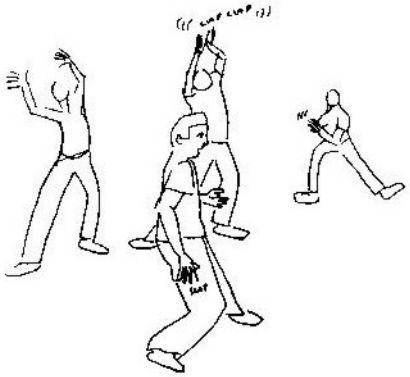
3. For homework or in class, let the children colour in the water cycle worksheet provided on the next page.

Criteria to assess learners during this languages lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner listened to the story, without being distracted or distracting				
The learner was able to share ideas in the group or with the teacher about a possible title for the 'Drip the Drop' story				
The learner was able to write a simple, short story about a personal experience				
The learner formed the letters of his/her story clearly and easily				
The learner used basic punctuation (capital letters and full stops)				

ACTIVITY TWO: MOVING AND SHAKING!

This ARTS AND CULTURE activity follows on from the story of the water cycle in Activity One with learners having fun expressing the story in different physical ways.



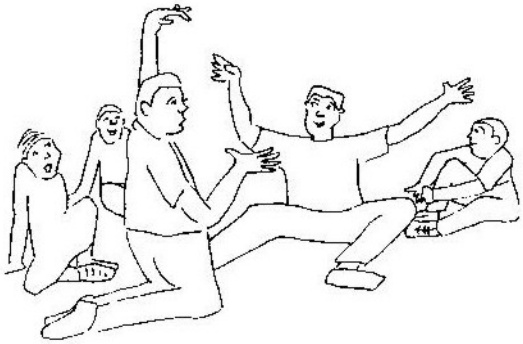
Getting Started – a space for drama
Create a physical space that encourages participation. If you are in a classroom, clear the desks and chairs to the side to create an open space. Make sure there is place for everyone to move or sit in a circle.

Warming Up
It is a good idea to take the class through some warm-up activities. Warming up in drama is more than just a physical warm-up, it also helps to build a group spirit and encourages the learners to focus (if they are too active it helps calm them down; if they seem lethargic and lazy, it will help you to energize them!!)

Warming Up 1: Walking around the space

1. Everyone in the class should walk around the space that you have created. Each child can walk in any direction they like and change direction as often as they want to. However, they must be careful not to bump into other learners.
2. Each time you clap your hands, the learners must change direction.
3. Everyone to:
   - Walk
   - Run
   - Skip
   - Hop
   - Leap
   - Jump
   - Gallop (like a horse)
   - Slide
   - Move sideways
   - Move backwards
   - Move diagonally
   - Turn around
4. Call out different situations to your learners and they must change the way they are walking for each situation. *(They must also change their facial expressions!)*
   - You are walking on hot coals
   - You are taking a puppy for a walk
   - You are swimming through syrup
   - You are walking on ice
   - You are jumping from puddle to puddle

Warming Up 2: Making body shapes



1. While the children are walking around the room, call out a number. The children need to quickly get into a group of that number and keep walking. For example, if you call out "two", the children must pair up with someone, link arms, and keep walking. They must not stop walking or worry about who they have paired up with – they must pair up with the closest person. If you call out "four", the four closest children must pair up with each other.
2. After this has been done a few times with different numbers, get the children into groups of five or six. Call out different shapes, and each group should make that shape with their bodies, for example "square" …. "rectangle"… "triangle" …. "circle". The children can make the shape standing up, sitting or lying down but everyone in the group must be part of the shape.
3. Since our theme in this series of lesson plans is WATER, get the children to form the letters W A T E R.

Using a shortened version of the story in Activity One, the children need to act out the water cycle story as you read it to them. They need to use their bodies and change their facial expressions as you read the story but not utter a word!! Remind them to be careful not to bump into others as they pretend to be a little water droplet on an exciting adventure!

Are the children ready? Let's start reading ….

Far out to sea, Drip the Waterdrop floated with his friends. Drip rolled over slowly in the sunlit ocean. The warmer he got, the harder it was for him to stay still. "I feel jumpy", he said.

Suddenly he was gone! Drip's friends vanished too, they burst from the water's surface and disappeared. They had ***evaporated.*** Drip was now a misty, invisible vapour floating up to the sky.

Winds carried Drip and his friends over the huge ocean towards the land. As he floated through the air, Drip gasped "What a view! But we are so high up in the sky! Those birds way down there look like tiny dots".

Soon the air got cooler and droplets crowded closer together. They gathered so close that they formed a thick cloud. "Boy, it's getting dark in here!"

whispered Drip, a bit afraid. The air got even cooler. “I feel wet”, Drip murmured.

Kaboom! With a flash and a crash, lightning ripped through the clouds. The raindrops began falling. “Ummpff” groaned Drip as he splashed onto a rock and rolled onto the ground.

The water drops joined together and sped along as part of a tiny stream. They played games as the stream flowed through the grasses and rocks. “I’ve got you!! You’re on!” Drip shouted as he caught another drop.

A short time later, Drip’s tiny stream joined another tiny stream to form a bigger one. This steam joined others until they all grew so big that they became one great, wide river.

The force of the flowing water amazed Drip. He and his friend held fast to each other as they bounced off the rocks, whipped around the bends, and splashed all over the place.

After a long while, the river began to slow down. Drip drifted along, silent for once. Until …. “Oomph! What was that?” Drip cried as a floating object bumped into him. Looking about, he spied crushed cartons, bobbing cans and cups, and globs of tar all around him. “How did I get into this disgusting mess?” he wondered.

As the river widened, more water flowed with Drip and his friends. More drops helped carry the filthy load downstream. Drip just missed being swallowed by an open bottle that was slowly sinking. In making his escape, he ran right into a large clump of water grass. Further along, more grass, reeds and other water plants spread out in a huge wetland. All the drops had to drift through it. When they got to the end of the wetland, they were much cleaner!

Drip and his friends passed out of the wetland and into a large bay. Just as he looked to the horizon, he noticed a funny taste. It seemed familiar. Then he remembered and understood. “Well! What do you know! We’re back where we started”, Drip exclaimed as he and his friends rode the top of a big wave. “So, where do you think the sun and the wind will send us next time?” No one knew but wherever they were sent the next time round, it was sure to be a great adventure again!!

Once the story and the acting is over, let the children sit down. Ask them:

1. What was that like?
2. Was it fun?
3. Was it easy to do without saying a word?
4. How did you feel?

5. Were there parts of the story that I was reading that you didn't know what face to pull or how to make your body move? *(If there are many children who felt unsure of what to do, you can show them how one would feel to 'float through the air' as Drip did, or a facial expression of disgust as Drip saw all the dirty water around him. You may also like to go through the story again, acting it out with the children so that those who are unsure, can follow your lead.*

Remind the children constantly that this is a fun activity and other than being careful and thoughtful of walking or bumping into someone else (no one must get hurt during these drama activities), they are free to be as expressive and creative as they like. No-one will laugh or scold them and they are all encouraged to participate and contribute their movements and facial expressions.

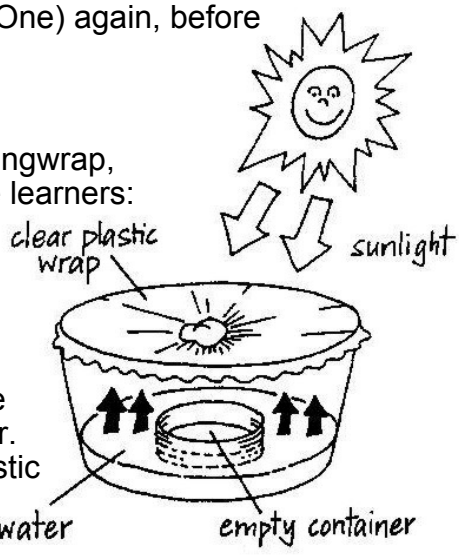
Criteria to assess learners during this arts and culture lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner was able to role play Drip the Drop during the story told by the teacher				
The learner was able to express his/her feeling in their facial and body movements during the story of Drip the Drop				
The learner was able to demonstrate the eight basic locomotor movements (walk, run, skip, hop, leap, jump, gallop and slide)				

ACTIVITY THREE: CREATE YOUR OWN WATER CYCLE

This NATURAL SCIENCES activity is a fun way of looking at part of Drip the Drop's journey!

You may like to read the story of Drip the Drop (Activity One) again, before you start this natural sciences activity.



Creating our own water cycle!
Individually if you have enough bowls, containers and clingwrap, or in groups if these materials are in short supply, let the learners:

1. Mix some salt in a glass of water. Make sure it dissolves.
2. Place a small container in the centre of a larger bowl.
3. Pour the salty water around it into the large bowl, NOT into the small container. Make sure that no water splashes into the small container.
4. Cover the top of the larger bowl with clear plastic wrap, making sure that it seals firmly. *(It must be airtight).*
5. Put a small stone in the centre of the plastic wrap, directly above the centre of the smaller container.
6. Place the bowl in direct sunlight.

(If the children are working in small groups, each child needs to contribute to the experiment in some way and so the group needs to decide who will do what).

What happens?
The water will evaporate as a result of the heat of the sun and will condense on the plastic wrap and drip into the smaller container like rain.

Questions to ask the children:

- Why do you think we added salt?
- What has happened to the salty water in the larger bowl?
- Is there any water in the smaller container? Taste it! What does it taste like? *Remind the children of the story of Drip the Drop and how he lost his saltiness when he evaporated out of the ocean and into the sky.*
- What do you think would have happened to the water if we had left the clingwrap off?
- What task did each child do? How did the group decide who would do what?

Remember that in the natural water cycle, the water that falls to Earth as rain, would eventually reach the ocean again and the cycle would continue. In our experiment above, we are not completing the full cycle as the evaporated water is not returning to the salty 'seawater'.

Criteria to assess learners during this natural sciences lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner discussed with the teacher (if done individually) or in the group who was going to do what during the construction of the water cycle system				
The learner played a role in carrying out instructions given by the teacher				
The learner could explain what he/she did during the construction of the water cycle system				
The learner was curious about what might happen if the clingwrap was left off the larger bowl				

ACTIVITY FOUR: DRIP THE DROP'S JOURNEY TO OUR TAP

This LIFE ORIENTATION lesson makes use of a fun comic story to encourage learners to discuss sources of clean and unclean water and simple water purification methods.


LWAZI ASKS- WHERE DO WE GET OUR DRINKING WATER FROM?
1
GAUTENG'S WATER IS PIPED FROM THE VAAL DAM TO RAND WATER'S PURIFICATION PLANTS
2
AT THE PLANTS, WATER IS PURIFIED 24 HOURS A DAY!
3
CHEMICALS ARE ADDED TO THE WATER TO GET RID OF THE DIRT
4
IN THE SETTLING TANKS, CHEMICALS AND THE DIRT FORM A LAYER CALLED FLOC, THAT SETTLES TO THE BOTTOM
CLEAN WATER IS DRAWN OFF INTO SAND FILTERS
FLOC
5
SAND TRAPS VERY SMALL BITS OF DIRT AS WATER FILTERS THROUGH IT
SAND
CHLORINE
CHLORINE IS ADDED TO KILL BACTERIA SO THAT THE WATER IS SAFE TO DRINK
6
AFTER THE PURIFICATION PROCESS, THE FINAL WATER GOES TO BIG HOLDING TANKS CALLED RESERVOIRS
7
AT LAST! THE WATER IS PIPED ALL OVER GAUTENG!
8
IN GAUTENG, WE USE 2800 MILLION LITRES OF WATER PER DAY!
2800 MILLION
9
EACH PERSON USES ABOUT 200 LITRES A DAY!
1 LITR
LUCKILY WE CAN JUST TURN ON THE TAP!
RAND WATER
P.O Box 1127 Johannesburg 2000
Tel: (011) 682-0911
MARK WIGGETT

Read the comic story of **'Where do we get our drinking water from?'** to your class. If you are able to photocopy the story onto an overhead transparency, please do. Even better, print out the story so that each child gets their own copy.

ACTIVITY:

- Have a jug of water and plastic/paper cups in the classroom. Let each learner drink some water.
  - What does the water taste like?
  - Does it taste the same as the water they drink at home?

Teacher, find out: *How does the school get its water?* *How do you know that it is clean?*

QUESTIONS TO ASK THE LEARNERS:

- How do we know that the piped water that Rand Water takes to the people in Gauteng, is clean? *(You may need to go through the comic story again and explain the processes of adding chemicals, filtering and finally adding chlorine to kill the bacteria).*

- Where would we find clean water, good for us to drink?

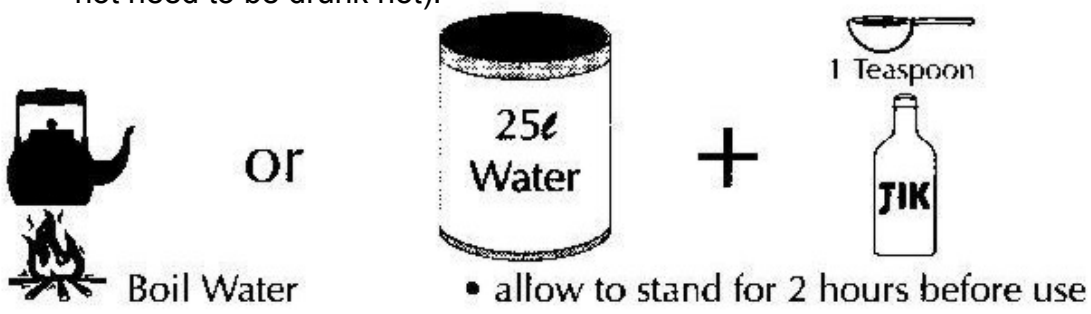
- Where would we find dirty water, not good for us to drink?

- Do any of you live in areas where you are not sure if the water is clean or not?

- Do any of you know of any simple way that you can clean (purify) your drinking water (especially if you are collecting it from a river or spring and are not sure that it is clean). *(Show the learners the two simple methods of water purification that follow and then make sure that each child is able to describe what you did).*

- A simple way of purifying water is to add a teaspoon of jik to every 25 litres of water. Jik is very strong and kills all the bacteria, making the water safe to drink.

- You can also boil the water, and that will kill any germs or bacteria that may be living in it. The water can then be left to cool (it does not need to be drunk hot).

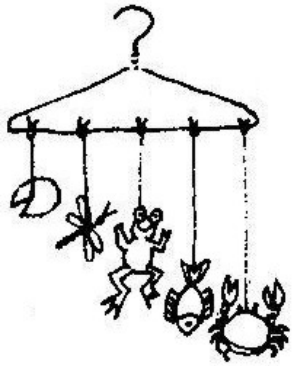


Criteria to assess learners during this life orientation lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner was able to describe sources of clean and unclean water				
The learner was able to describe the two simple water purification methods, shown to them by the teacher				

ACTIVITY FIVE: JUST FOR FUN!

Have fun with your learners constructing a mobile which will represent the different plants and animals found in the different levels in a pond or stream.



Each learner will need:

- an old wire coat hanger
- string
- cardboard
- crayons
- scissors

Level 1: Water plants or those found in wetland areas such as bulrushes and reeds

Level 2: Just above the water surface (animals like dragonflies)

Level 3: Water surface (such as water striders or a frog on a lily pad)

Level 4: Just below the surface (fish and tadpoles)

Level 5: Base of the river or pond (animals like crabs)

Water is life!

Share-Net

This pack supports an introduction for young learners to an Eco-School's focus on resource management

Grade 3

This pack contains:

Activity One: This week-long **MATHEMATICS** activity encourages learners to take careful note of the water they use by keeping a daily water diary.

Activity Two: A **LANGUAGES** exercise which encourages learners to discuss and write about their experience of walking along two rivers, one clean and beautiful and one dirty and polluted.

Activity Three: This **NATURAL SCIENCES** activity focuses on the importance of water in our lives and the problems of pollution. Learners summarise their 'saving water' and 'how to stop water pollution' group discussions with colourful posters.

Activity Four: A **LANGUAGES** activity encouraging learners to use a dictionary before they find the hidden words in the word search.

Activity Five: How do carrots drink? An interesting experiment to try with the class.

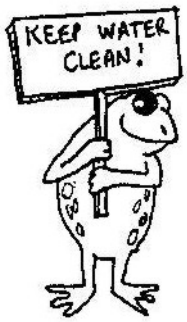
WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10 which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031 (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. Learners investigate how much water they use by keeping a water diary of their daily water use.	Mathematics	**Learning Outcome 4:** Measurement: The learner will be able to use appropriate measuring units, instruments and formulae in a variety of contexts. **Learning Outcome 5:** Data Handling: The learner will be able to collect, summarise, display and critically analyse data in order to draw conclusions and make predictions, and to interpret and determine chance variation.	• Reads and writes analogue and digital clock time in terms of hours, half-hours, quarters of an hour and minutes. • Collects data (alone and/or as a member of a group or team) in the classroom and school environment to answer questions posed by the teacher and class. • Draws pictures and constructs pictographs and bar graphs that have a 1-1 correspondence between own data and representation.
2. Learners discuss and write about their experience of walking along two rivers, one clean and beautiful and one dirty and polluted.	Languages	**Learning Outcome 2:** Speaking: The learner will be able to communicate confidently and effectively in spoken language in a wide range of situations. **Learning Outcome 4:** Writing: The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.	• Recounts personal experiences and expresses feeling and opinions about them. • Contributes to group and class discussions. • Uses various pre-writing strategies to initiate writing (e.g. brainstorming, talking with friends, visual images). • Writes a selection of short texts to suit the purpose and the audience (e.g. one-or two-paragraph stories).
3. Learners discuss the importance of water and summarise their 'saving water' and 'how to stop water pollution' group discussions with colourful posters.	Natural Sciences	**Learning Outcome 3:** Exploring Issues: The learner will be able to make informed decisions about social and environmental issues and problems.	• Identifies one or more pollution issues in a particular context. • Suggests ways to reduce the pollution problem being investigated. • Proposes solutions to reduce the pollution problem being investigated (making choices).
4. Learners use a dictionary before they find the hidden words in a word search.	Languages	**Learning Outcome 1:** Listening: The learner will be able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations. **Learning Outcome 3:** Reading and Viewing: The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts. **Learning Outcome 4:** Writing: The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.	• Listens attentively (extending concentration span) and responds to an extended sequence of instructions appropriate to learner's level. • Develops a vocabulary by using a dictionary and keeping a personal dictionary. • Builds word bank and personal dictionary.
5. Just for fun! How do carrots drink?	-	-	-

ACTIVITY ONE: HOW MUCH WATER DO I USE?

This week-long MATHEMATICS activity encourages young learners to take careful note of the water they use by keeping a water diary of their daily water use.



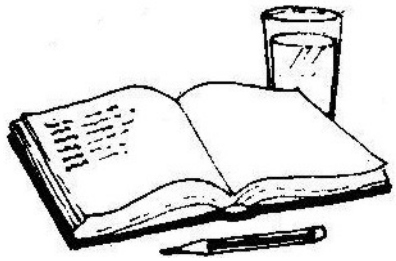
Water is very important to us as we cannot live without it. Did you know that 75% of our body is made up of water and the longest we can go without drinking water is 3 to 4 days! With more and more people needing clean water there is a greater demand for water in our country.

Sadly, water pollution is very common in South Africa. One of the most common pollutants comes from wastewater from towns, especially where people do not have sewage and water cleansing facilities. Water pollution can cause health problems so we need to make sure that we do not pollute the water supplies that we have. We also need to make sure that we use water carefully and wisely and not wastefully.

In order to be more careful about the water we use, we need to look at how much water we each use every day. We can do this by keeping a daily water diary.

ACTIVITY:

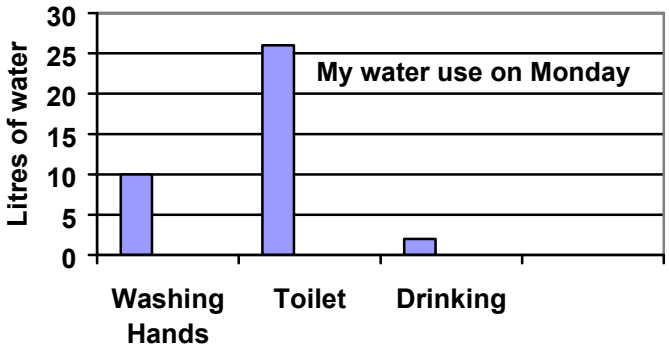
- Hand out the 'My Water Diary' provided on page 3. Let the children keep a water diary of all the activities where they use water, during the school day. You can make it a day diary, that is, for one day they record every time they use water. Or, you could be more ambitious and get the learners to keep the diary for a week.



The following amounts are rough estimates of water use, which may help the learners when calculating their water usage.

- Cup of water/juice – 250 ml
- Flushing toilet – 13 litres
- Having a short shower (10 minutes) – 30 litres
- Having a long shower (30-40 minutes) – 120 litres
- Washing hands (with water running) – 5 litres
- Washing hands (without the tap running) – 1 litre

- At the end of the day / week, get the learners to draw a bar graph of their water use at school.



- Discuss with your class where most of the water is being used.
- Is it possible for the learners to save water during their daily activities? How?

You may want to take this activity further and get the children to extend their water diary to include after-school activities (such as having a bath/shower at home, helping to wash a car or their bicycle or watering the home vegetable garden or flower beds).

More estimates for the learners to use if you extend this activity to after-school activities:

- Brushing teeth (with water running) – 2 litres
- Having a bath – 90 litres
- Washing a sinkful of dishes – 18 litres
- Washing the car (with a hosepipe) – 50 litres
- Watering the garden (15 minutes) – 50 litres
- Washing clothes in an automatic washing machine – 250 litres
- Washing clothes in a twin tub machine – 40 litres
- Topping up the pool – 4 000 litres

Remember, if the children recycle their bath water at home and use it for watering flowers or vegetables, they will still need to record this, 90 litres, for a bath but there will be '0 litres' in the amount of "how much water did I use" column for watering the garden – see example below.

Day	Time	What did I do?	How much water did I use?
Monday	6pm	Had a bath	90 litres
Monday	6.30pm	Watered the vegetable garden with the bath water	0 litres

Criteria to assess learners during this mathematics lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner was able to fill in the time on the 'My Water Diary' worksheet				
The learner was able to collect information (data) during the time they spent at school and correctly write it down in their water diary				
The learner was able to draw a bar graph of the data from their water diary				

My Water Diary

Name:_____

Day	Time	What did I do?	How much water did I use?
e.g. Monday	*7.30am*	*Flush toilet*	*13 litres*

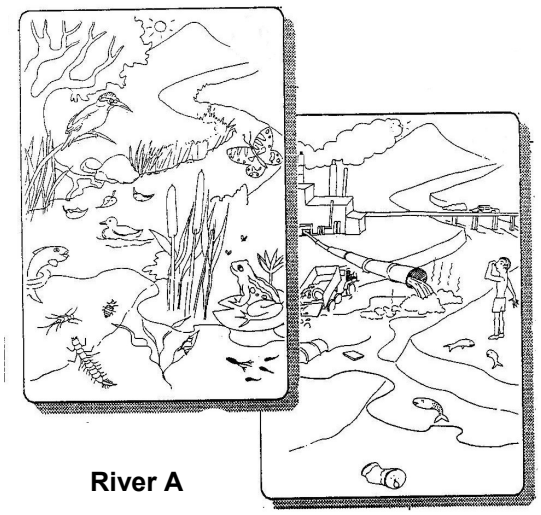
ACTIVITY TWO: A WALK ALONG TWO RIVERS

This LANGUAGES exercise encourages learners to discuss and write about their experience of walking along two rivers, one clean and beautiful and one dirty and polluted.

ACTIVITY:

- Hand out the River A worksheet. As a class, let the children discuss what they see – what creatures and plants can they see, have any of them ever been to a beautiful river or stream (when, with who, how did they get there, can they remember where it was?); how do they feel when they see a river like this?

- Hand out the River B worksheet. As a class, let the children discuss what they see – ask them what creatures and plants can they see (if any), have any of them ever been to a river or stream that looks like this (when, with who, how did they get there, can they remember where it was?); how do they feel when they see a river like this?



River A

River B

Ask the children:

1. **Which river would you like to swim in or drink from?**

2. **Why has River B become polluted?** *(Possible answer: The plant and animal life has been destroyed. There are horrible smells and toxic human pollutants emptying into the water which have killed the river animals and plants. This means that the river is 'dying'. The river can no longer cleanse itself and it is a health hazard and unpleasant to be near).*

3. **How can we get River B to look like River A?** *(Some ideas: Cleanse our waste **before** it leaves the factories and towns. Stop human pollution going into the river. Plant indigenous trees along the banks – this will reduce the noise and disturbance, make the river a beautiful place to be, create homes for birds and animals. Can the children think of some laws (they can make up their own) to protect our rivers, streams and fresh water?)*

4. **Why should we try to keep all our rivers in South Africa like River A?** *(Possible answers: To make sure that we always have clean water for drinking and other human uses; to make sure that animals and plants have places to live; to make sure that we look after and conserve our beautiful places).*

Having brainstormed ideas and emotions within the class, about the two rivers, the children can now write one or two paragraphs on which river they would rather swim and drink from and why.

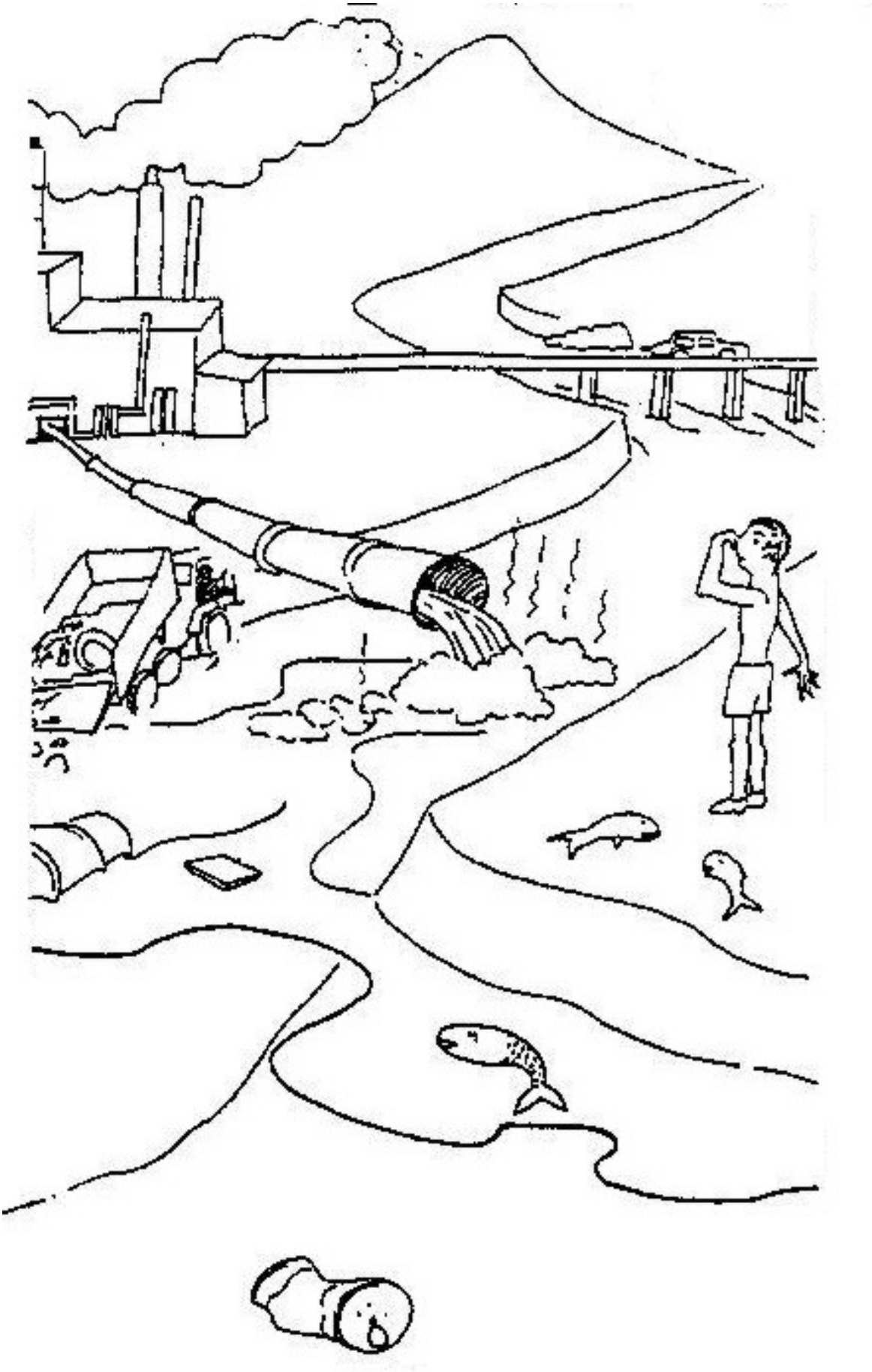
They will also need to write a title for their piece of writing.

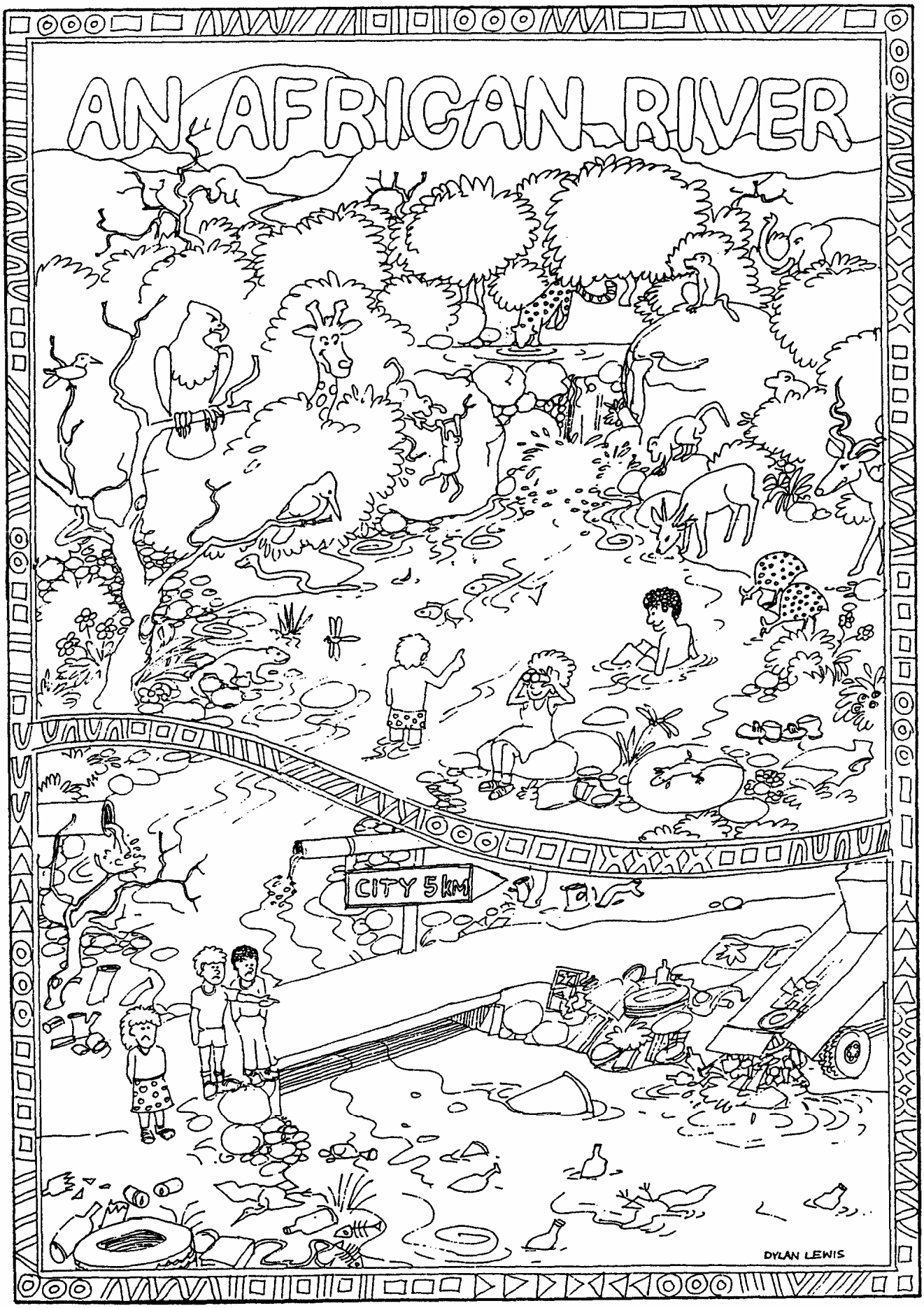
- For the keen artists in the class, let the children take the two river worksheets home and colour them in. Or better still, draw their own rivers and colour them in! An additional “An African River” colour-in worksheet is also available at the end of this activity.

- If your school is fortunate enough to live close to a river or stream, why not consider taking the children for a walk along the river. It may be useful to divide the class into groups of 4 or 5 children, each with pen and paper so that they can make notes of what they see – plants, animals, litter, anything and everything! Your class and you may even decide to ‘adopt’ your nearby local river and ensure that it is kept clear of alien invasive plants and litter!

RIVER A WORKSHEET

RIVER B WORKSHEET




AN AFRICAN RIVER
CITY 5km
DYLAN LEWIS

Criteria to assess learners during this languages lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner contributed answers and suggestions to questions asked about Rivers A and B				
The learner spoke of a personal experience when visiting a river and/or expressed their own feelings when speaking about Rivers A and B				
The learner wrote a one or two paragraph story on which of the two rivers they would rather drink from and swim in				

ACTIVITY THREE: THE IMPORTANCE OF WATER, AT HOME, AT SCHOOL AND IN MY COMMUNITY

This NATURAL SCIENCES activity focuses on the importance of water in our lives and the problems of pollution. Learners summarise their 'saving water' and 'how to stop water pollution' group discussions with colourful posters.

Without water, no life could survive on our planet. It is precious and important and too many of us are wasting it! If we all learn to value and conserve our freshwater, there will be enough for everyone, now and in the future. Not only will there be enough for all people on the Earth, but there will be enough for all the animals and plants as well.

ACTIVITY:

- As a class, and using the questions below, the children can discuss the importance of water. Encourage them to think about who or what else needs water (not only people but animals and plants as well). Encourage the children to share their ideas on what causes water pollution and what are ways of reducing pollution.

The following questions can be used to prompt the class discussions.

- Why is water important to us?
- How would life be different with very little water?
- Is water only important to humans?
- How can we use water more wisely and carefully?
- How is water being polluted?
- How does polluted water affect us, our family and our friends?
- What can people do to reduce pollution in water?
- What can I do to reduce water pollution?
- What can people do to save or recycle water?
- What can I do to save or recycle water?

Divide your class in small groups of four or five learners. Half the groups can then draw up a list on "How to save water", the other half on "How to stop water pollution". Once the lists have been drawn up, the groups can each design a colourful, bright and eye-catching poster (with some of their ideas on it) and then display them in the classroom or around the school. An example of a list is given below:

"How to save water"

1. Switch taps off properly after you have used them.
2. Wash dishes in a shallow sink of water rather than washing them under a running tap.
3. Take shorter showers (5 minutes or less) or shallow baths. Showers generally save up to one third of water used.
4. Turn off the tap when brushing your teeth and washing your hair.
5. Use stale drinking water to water plants rather than throwing it away.
6. Reduce the amount of water used with each toilet flush by putting a cool drink bottle filled with stones into the toilet tank.
7. Use rain barrels to collect water for gardening.
8. In summer, water your garden early in the day (before 9:00am) or late (after 4pm) to minimise water loss through evaporation.

Did you know? You can save up to 4 400 litres of water a year by not letting the water run while you brush your teeth!! Whew, that's a lot of water – enough to fill up a swimming pool!!

Criteria to assess learners during this natural sciences lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner was able to identify that water pollution was a problem (an environmental issue)				
The learner was able to contribute towards the class discussions on what causes water pollution				
The learner was able to contribute ideas on how to prevent water pollution				
The learner was able to contribute ideas on how they could reduce water pollution				
The learner was able to contribute ideas on how they could save water				

ACTIVITY FOUR: WHERE IS THAT WORD HIDING?

This LANGUAGES activity encourages learners to use a dictionary before they find the hidden words in the word search.

In an exercise book, let the children write down the words below and using dictionaries, let them look up the meaning of each word and write it down as well. If they have not already got a personal dictionary, they need to start one now. If they already have a personal dictionary, let them add any of the words below that are 'new words' to it.

Next, they need to find ALL the hidden words in the letter maze below. They need to remember that some of the words go up and down, some go back and forwards and others go diagonally.

1. water
2. pollution
3. shortage
4. river
5. sewage
6. taps
7. health
8. recycle
9. clean
10. factory

W	T	S	H	O	R	T	A	G	E
H	A	A	F	K	A	H	V	M	E
I	P	T	H	A	G	F	X	K	G
G	S	O	E	K	C	K	K	T	A
J	U	C	A	R	L	T	S	I	W
P	O	L	L	U	T	I	O	N	E
S	E	E	T	R	E	V	I	R	S
U	D	A	H	U	T	T	E	D	Y
F	J	N	E	T	L	D	O	D	H
T	U	E	L	C	Y	C	E	R	I

For the more adventurous learners, see how many words from the list can be used to make one complete (and sensible!) sentence.

Criteria to assess learners during this languages lesson

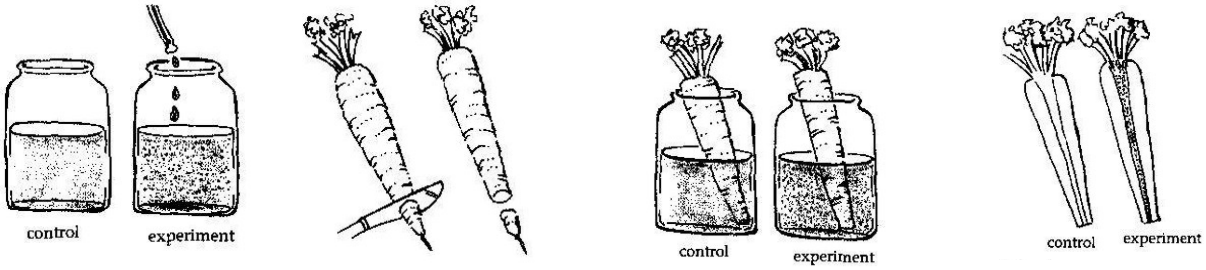
Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner was able to listen to and follow all the instructions regarding the word puzzle – using a dictionary to find out what the word means, writing the word and meaning down in their personal dictionary and then finding the word hidden in the maze				
The learner used a dictionary				
The learner added new words to their personal dictionary				
The learner understood the meanings of any new words				

ACTIVITY FIVE: JUST FOR FUN!

An interesting activity to try with your learners as they learn about water!

How do carrots drink?

Carrots are **taproots** – big roots that grow straight down into the ground. Roots hold the plant in place, keep soil around it, absorb nutrients, and move water from the soil to the leaves.



1. Half fill two glass jars with water. To one jar add 10 drops of red (or blue or green) food colouring – this is the experiment. The plain water jar is the control.
2. Choose two young fresh carrots that still have some leaves at the top. Cut the tips off both carrots and place one in each jar.
3. Put the glass jars on a sunny windowsill and leave for three days so that the carrots can absorb water.
4. Take the carrots out of the jars and slice in half lengthwise. (Don't let the learners do this on their own – it is dangerous!) Compare the insides of the experiment and control carrots.

What is happening?

The coloured water has been pulled up through tiny channels in the centre of the carrot and has stained the carrot red. This is the water transport system that takes water and nutrients up to the leaves. Plants also have a sap transport system that flows both up and down the plant and transports food made in the leaves to the rest of the plant.

Water Creepy Crawlys

Share-Net

This pack supports an introduction for learners to an Eco-School's focus on health and safety

Grade 4

This pack contains:

Activity One: Learners look for different water creatures during an explorative water investigation. This **NATURAL SCIENCES** activity should take place at a river, stream, dam, nearby wetland or pond.

Activity Two: Following Activity One, learners use **MATHEMATICS** to count and illustrate the numbers and types of creatures they found. As many water creatures are sensitive to water pollution, learners can also determine the overall health of the water they explored.

Activity Three: Certain water insects are known as 'indicator species'. This means their presence in a river, stream or pond indicates polluted or unpolluted water. Within this **LIFE ORIENTATION** lesson learners look at the relationship between water insects and water quality and water insects and our health.

Activity Four: This **TECHNOLOGY** lesson encourages learners to think about the health of water and how to make water safe to drink. It also looks at how indigenous people collected clean and healthy water in the past.

Activity Five: This **LANGUAGES** writing exercise allows learners to imagine what it would be like to be one of the water creepy crawlies that was caught during their water study in Activity One!

WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10, which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031 (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

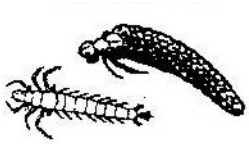
Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. An explorative water investigation.	Natural Sciences	**Learning Outcome 2:** Constructing Science Knowledge: The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.	• Recalls meaningful information: At the minimum uses own most fluent language to name and describe objects, materials and organisms. • Categories information: Sorts objects and organisms by a visible property.
2.Learners measure, count and illustrate the numbers and types of creatures they found. As many water creatures are sensitive to water pollution, learners can also determine the overall health of the water they explored.	Mathematics	**Learning Outcome 4:** Measurement: The learner will be able to use appropriate measuring units, instruments and formulae in a variety of contexts. **Learning Outcome 5:** Data Handling: The learner will be able to collect, summarise, display and critically analyse data in order to draw conclusions and make predictions and to interpret and determine chance variation.	• Estimates, measures, records, compares and orders two-dimensional shapes and three-dimensional objects using S.I. units with appropriate precision for: mass using grams (g) and kilograms (kg). • Uses appropriate measuring instruments to appropriate levels of precision including: bathroom scales, kitchen scales and balances to measure mass. • Organises and records data using tallies and tables. • Draws a variety of graphs to display and interpret data (ungrouped) including: bar graphs.
3. Certain water insects are known as 'indicator species'. This means their presence in a river, stream or pond indicates polluted or unpolluted water. Learners look at the relationship between water insects and water quality and water insects and health.	Life Orientation	**Learning Outcome 1:** Health Promotion: The learner will be able to make informed decisions regarding personal, community and environmental health.	• Explores and reports on links between a healthy environment and personal health.
4. Learners think about the health of water and how to make water safe to drink. They also look at how indigenous people collected clean and healthy water in the past.	Technology	**Learning Outcome 3:** Technology, Society and the Environment: The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.	**Impact of Technology** • Expresses opinions about how technology products make people's lives easier. **Bias in Technology** • Expresses reasons why certain groups of people might be disadvantaged when using technological products.
5. A writing exercise which allows learners to imagine what it would be like to be one of the water creepy crawlies that was caught during their water study.	Languages	**Learning Outcome 1:** Listening: The learner will be able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations. **Learning Outcome 2:** Speaking: The learner will be able to communicate confidently and effectively in spoken language in a wide range of situations. **Learning Outcome 4:** Writing: The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.	• Enjoys listening to different kinds of oral texts and responds appropriately. • Uses language with ease for interpersonal communication in everyday conversation. • Shares ideas and offers opinions • Writes for personal, exploratory, playful, imaginative and creative purposes.

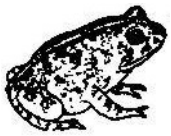
ACTIVITY ONE: THERE'S A CREEPY CRAWLY IN THIS STREAM!!

Learners look for different water creatures during an explorative water investigation. This NATURAL SCIENCES activity should take place at a river, stream, dam, nearby wetland or pond. If this is not possible, the teacher will need to photocopy and cut out some of the creatures on the identification sheet on page 4 and set up an imaginary stream or pond in the classroom!!

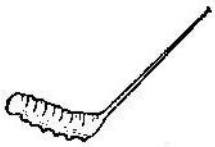
What is a Water Creepy Crawly?

A Water Creepy Crawly is an animal that is able to breathe and live in or on water. Some of them are beautiful, some are rather ugly, some of them are tiny, others are quite big and all of them have special things about them which make it possible for them to live, breathe, feed, grow and reproduce in or on water.





It's time to see what creepy crawlies we have in our stream!



What you will need:

- Containers (ice-cream containers or 2 litre plastic bottles cut in half)
- Small plastic cups
- Pencils (to record findings)
- Plasticine
- Photocopies of the *'Water Creatures Identification Sheet'* and the *'More information on each of the water creatures' sheets*
- Coloured pencils or crayons

What to do with the learners:

1. Divide the class into groups of four.

2. Give each group one container, a small plastic cup, a pencil, coloured crayons and a photocopy of the *'Water Creatures Identification Sheet'*.

3. Each group needs to decide on a name for themselves. They can use the *'Water Creatures Identification Sheet'* (and call themselves, for example, 'the mayflies' or 'the water shrimps') or the groups can make up their own names.

4. Each group must collect a full container of river or stream water and then carefully lift up rocks and rotting branches that are in the water and inspect them. Any animal that is found should be gently removed with the end of a pencil or stick and carefully placed into the water container.

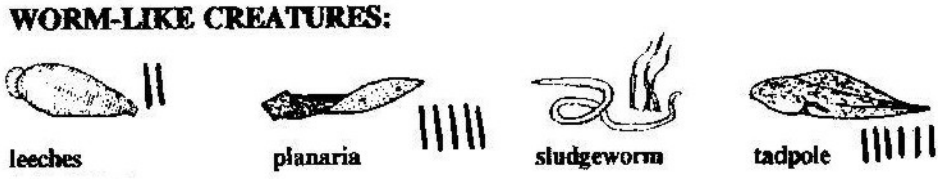
5. Learners can explore the stream and collect as many creepy crawlies as they can for 20 to 30 minutes (they may see larger creatures, such as fish, which they are not able to catch – they must make a note of this on their *'Water Creatures Identification Sheet'*).

Make sure that the children do not harm ANY of the creatures that they find in the stream. They must be VERY VERY careful when handling these small delicate animals.

You, the teacher, need to:

- Hand out a photocopy of the characteristics of each animal (pages 5 and 6) and some plasticine to each group.

- The groups need to colour in, on their identification sheet, the creatures they are able to identify. They must also keep a 'tally' on their identification sheet of how many of each creature they find *(see example below).*



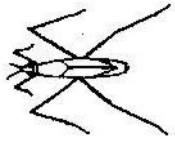
- The groups then need to read the information about the creatures they have caught and discuss within their group what makes each creature unique and successful in living in water and not on land.

- Lastly, using the plasticine, the groups each have to make a water creepy crawly that can live in water (it can be an imaginary, non-existent animal, never before seen by humans BUT it must be able to breathe in water, be strong enough not to be swept away by strong water currents and it must be able to eat in water).

Bring all the groups together, with their containers full of creepy crawlies, and ask the class the following questions:

1. What animals did each group find?

2. Why do you think these animals are better able to live in the water than on land?



3. How do the animals make sure that they are not swept away in the strong water currents?

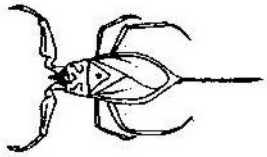
4. If you were to sort these water creepy crawlies into different groups, using only one physical thing that you can see on the animals, what would you choose? *(some of the learners may use legs to sort the insects, i.e. those with none, two, four, or more than four, others may use the presence or absence of wings).*

5. If you lived in water, what would you need to make sure you lived safely and happily?

6. Each group can now share their plasticine creepy crawly with the rest of the class. They need to explain what makes their creature so special and why it is able to survive in water.

Teacher, make sure that all the groups have coloured in all the creatures they found during the water study and have a 'tally' next to each coloured-in animal.

Immediately after this activity, return ALL the creatures back to the stream. This needs to be done gently and carefully. Make sure that none of the animals are left in the plastic containers.



Criteria to assess learners during this natural sciences lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner took an active part in the water investigation and collected water creatures to add to the group's collection				
The learner was able to identity the water creatures that were found by the group				
The learner contributed to the discussions of describing his/her group's plasticine animal				

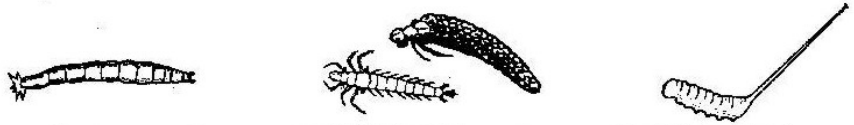
Water Creatures Identification Sheet

WORM-LIKE CREATURES:

leeches planaria sludgeworm tadpole

LARVAE:

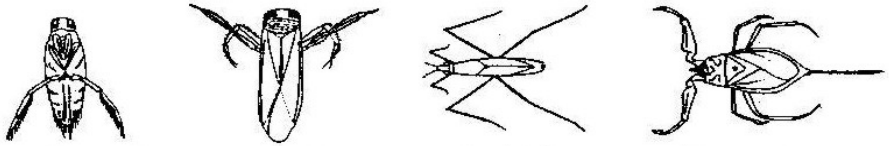
mosquito larva and pupa midge larvae whirligig larva



cranefly larva caddisfly larvae rat-tailed maggot

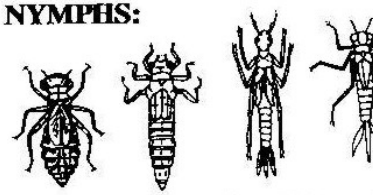
BEETLE-LIKE ORGANISMS:

whirligig beetle scavenger bug predacious beetle



backswimmer water boatman water strider water scorpion

NYMPHS:

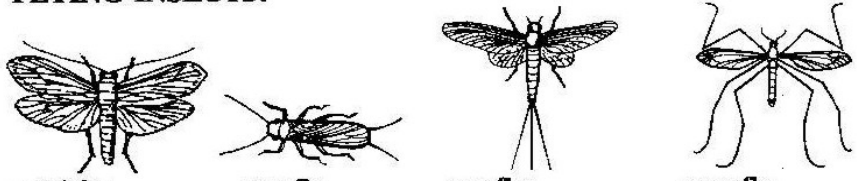


dragonflies damselflies stonefly mayfly

SHRIMPS

shrimp

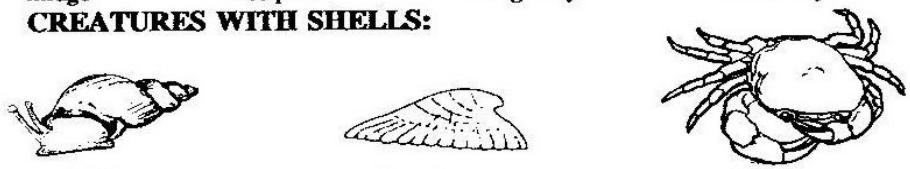
FLYING INSECTS:



caddisfly stonefly mayfly cranefly

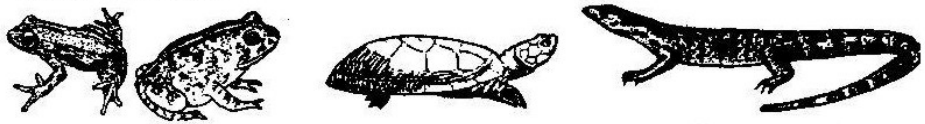
midge mosquito dragonfly damselfly

CREATURES WITH SHELLS:



snail limpet crab

OTHER WATER ANIMALS:



frogs and toads water terrapin water leguaan

fish birds otter water mongoose

More information on each of the water creatures on your identification sheet

Leech: Leeches are small worm-like creatures that have suckers to suck the blood or body fluids from other animals. They like nutrient-rich water that is low in oxygen. They are mostly parasitic, which means they prey on other living animals, including people. If leeches stay on your body for too long they can cause your blood pressure to drop and make you feel ill. The suckers of a leech release a chemical, which stops blood from clotting so that they can feed properly.

Planaria: They are dark brown with flat bodies. Planarias live in clean, unpolluted water. They can regenerate themselves if cut in pieces, with each piece growing into a new individual.

Sludge Worm: Their tails are used as gills to absorb oxygen. They are dark red due to the high oxygen levels in their bodies. Sludge worms like to eat mud, and they are able to live in polluted waters.

Water snail and limpet: Water snails have a soft body protected by a coiled shell. They have a muscular foot that sticks out of the shell and is used to move. Limpets have a flattish shell covering their body. This shell has a foot that sucks on to the smooth surface of rocks and plants. Snails eat water plants. Limpets eat algae on rocks and on water plants. Snails can live in slightly polluted water. Snails can carry very small (microscopic) animals, like bilharzia, inside their bodies, that can make people sick. Snails that carry bilharzia like slow moving waters and stay near reeds to keep from being washed away. People who have bilharzia often feel very tired and may have kidney damage.

Damselfly: Adult damselflies are smaller and thinner than dragonflies. Nymphs are usually brown or green and have three large, flat gills at the end of the abdomen. They swim and run among stones at the bottom of streams.

Back swimmer: They swim and rest on their backs. The hind legs are used for movement. They breathe at the surface and an extra supply of air is trapped amongst the hairs on the upper side of the body.

Water scorpion: This insect does not have a poisonous sting. It is usually brown and often looks like a dead leaf! It creeps around amongst water reeds or in the mud at the bottom of shallow pools. The water scorpion breathes through its tail – this is used like a snorkel.

Water strider: The water strider has long middle and back legs for resting and skating on the surface of the water. Water striders eat insects which have fallen into the water. To find their prey, water striders have sensory areas in their feet. With these they can feel the vibrations of the insects that have fallen into the water.

Midge: Adult midges or gnats are tiny insects that are usually seen flying in swarms above the water. Midge larva are often called ‘bloodworms’ because many have red or brown body fluids. The larvae are often found in mud in slow-flowing or still water. The red midge larvae are usually found in polluted water. The adult midge never eats anything! Its stomach remains an empty air sac. Generally midges are found in water that is slightly polluted.

Cranefly: Cranefly larvae are found in water, in moist ground or in mud or under leaves. The larvae eat roots, dead plants and some small water animals like worms. The cranefly is often called daddy-long-legs!

Rat-tailed maggot: Rat-tailed maggots are usually grey with a fat wrinkled body and a long breathing tube. They can live in mud and polluted water.

Caddisfly: The larvae have 6 long legs close to the head. Caddisflies like clean, unpolluted water.

Mosquito larvae: Mosquito larvae live in stagnant (still) pools of water just below the surface. They feed on tiny plants and animals. Male mosquitos suck plant juices when they are adults but adult female mosquitos suck blood from humans and other animals. If they are infected, the female mosquito will then pass on malaria to people, which can be deadly! Mosquito larvae are often found in poorly oxygenated ponds of water.

Whirlygig beetle: The larvae look like small centipedes. Adult whirligig beetles are smooth and streamlined and are usually a shiny grey colour. Adults and larvae both feed on dead or dying insects that have fallen into the water.

Water beetles and bugs: All the water beetles and bugs have flat, smooth bodies. They are usually found in clean streams and rivers.

Dragonfly: The adults fly very fast. The nymphs of dragonflies are aggressive feeders who eat other insects. They can live in fairly polluted water. When it is ready to become a dragonfly it sheds its skin emerging as an adult dragonfly.

Water boatman: They swim mostly on the surface of the water and dive down deeper to feed on algae. They catch bubbles of air in their body hairs that they use to breathe from when they dive down deeper – similar to a scuba diver! This air bubble is what gives the Boatman a silvery colour in the water.

Mayfly: The nymphs (baby mayfly) have three long thin tails and have gills on the sides of their bodies. Mayflies need unpolluted water with plenty of oxygen to live in. They eat vegetable matter. The adult mayflies only live for one day once they hatch, and in this time they must find a mate and reproduce before they die. This is why mayflies often all hatch at the same time. This gives them the greatest chance of success.

Stonefly: The nymphs have two thin 'tails'. They live under stones in running streams. They can only live in clean, unpolluted water. Nymphs eat small water insects and algae. If one finds stoneflies in a stream, it usually indicates good water quality as they are affected by small amounts of pollution.

Crab: Crabs have a hard exoskeleton. They have flat bodies and 5 pairs of legs. Crabs eat mostly dead or dying animals but also catch some live prey, such as tadpoles.

Freshwater fish: Fish have streamlined bodies that are covered with slimy scales. Fins are used to move. Breathing is through their gills.

Frogs and toads: Tadpoles have gills and live under water. Adult frogs and toads have lungs. Frogs spend their whole lives in very moist areas or near water. Toads are stout, have short limbs and live in open country. Platanna (clawed toads) are neither true frogs or toads. They spend their whole lives in water.

Terrapin and leguaan: Water terrapin are usually a muddy brown colour. They have a scaly skin and scales modified to form a leathery shell. Water leguaan are very large lizards with a patterned scaly skin.

Water birds: A wide variety of water birds are found in and around water systems. They have beak and feet adaptations for feeding in streams, rivers, ponds and wetlands.

Otter and water mongoose: Otters and water mongoose are shy animals and are seldom seen. You may see their droppings, which contain large quantities of crab shells.

Freshwater shrimp: They feed on small animals and plants and are usually transparent, green or brown.

ACTIVITY TWO: EVEN CREEPY CRAWLIES LIKE CLEAN WATER!

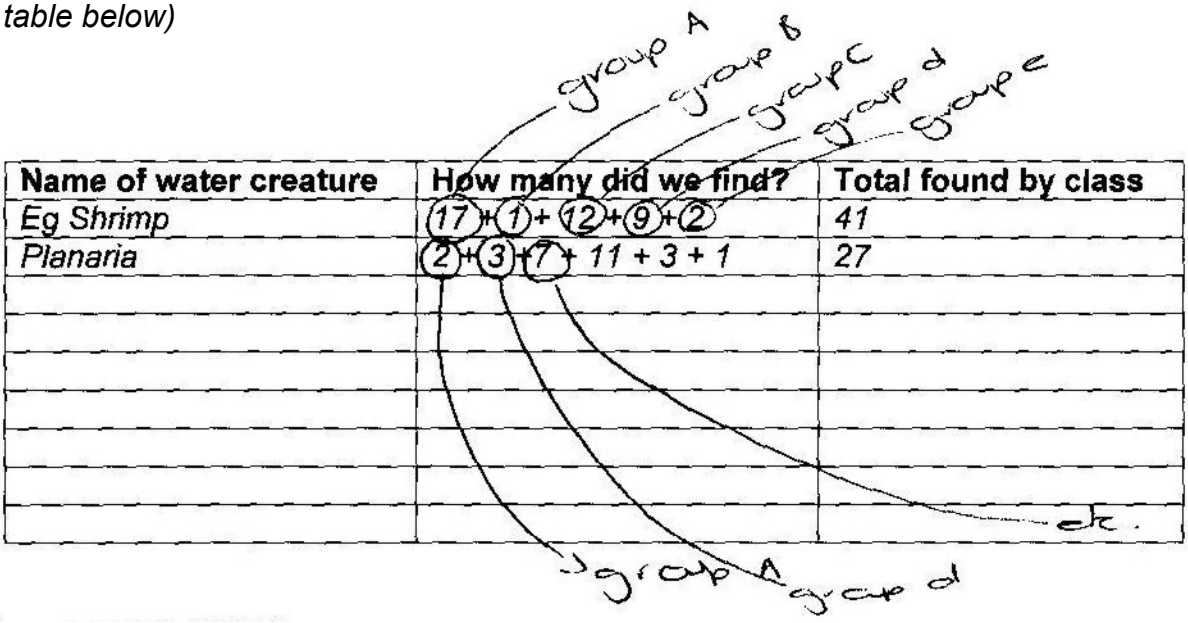
Following on from Activity One, learners use MATHEMATICS to count and illustrate the numbers and types of creatures they found. As many water creatures are sensitive to water pollution, learners can also determine the overall health of the water they explored.

ACTIVITY:

1. Get each group to count up the tallies of each different type of water creature that they found, in Activity One, and write them down in a table *(photocopy the table provided on page 9).*

2. Using the individual tables from each group, the teacher can draw a large table on the chalkboard.

3. Let the learners add up all the numbers of creatures that were found as a class *(see table below)*



Name of water creature	How many did we find?	Total found by class
Eg Shrimp	*17 + 1 + 12 + 9 + 2*	*41*
Planaria	*2 + 3 + 7 + 11 + 3 + 1*	*27*

ASK THE LEARNERS:

1. How do we measure water? *(Choose the correct answer/s)*
   milligrams kilograms millilitres ounces tons litres

   (*Answer: millilitres and litres).*

2. *Hand back the water containers that the groups used during the previous activity*. Estimate the mass of your group's container in grams. Write down your estimate.

3. Fill your container with tap water. Now estimate the mass of the water in your group's container. Write down your estimate.

4. Using a kitchen scale find out the mass of your container, filled with water. Each group must write down the answer.

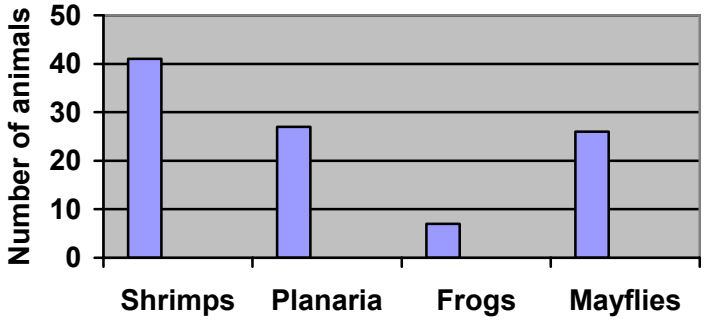
5. Now, empty the water out of the containers (preferably onto a flower bed or vegetable garden outside so as not to waste water) and this time, find out the mass of the empty container. Each group must write down this answer.

6. What is the mass of the water in grams? (*subtract the total mass measured on the scale from the mass of the empty container to give the mass in kilograms or grams for the water*).

7. How accurate were your estimates?

8. Draw a bar chart of the types and numbers of animals found in your group *(see example below).*

Graph showing number of creepy crawlies we found in our stream



9. How many water creatures prefer only clean water? *(The learners may need to use the notes from Activity One).*

10. How many of the creatures you found can live in slightly polluted water? *(Learners may need to read the information sheets again)*.

11. How healthy do you think the river/stream is that we explored in Activity One *(remember that water creatures are very good indicators of water quality – certain creatures like mayfly nymphs and stonefly nymphs are only found in clean, unpolluted water).*

Criteria to assess learners during this mathematics lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner was able to estimate the mass of the water and the mass of the container				
The learner was able to use the scale to measure the mass of the container & the mass of the water				
The learner was able to tally up the information on the identification sheet and transfer it onto the table				
The learner was able to draw a bar graph of the water creatures found during the water study				

Name of Group: _____

Name of water creature	How many did we find?
e.g. Shrimp	*17*

ACTIVITY THREE: DID YOU KNOW THAT CREEPY CRAWLIES CAN TELL US HOW HEALTHY A STREAM IS?

Certain water creatures are known as 'indicator species'. This means their presence in a river, stream or pond indicates polluted or unpolluted water. Within this LIFE ORIENTATION lesson learners look at the relationship between water creatures and water quality and water creatures and our health.

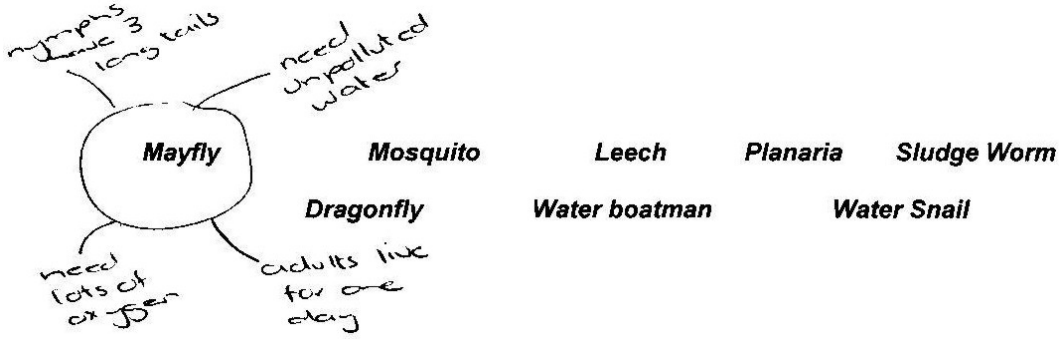
Teacher, write the names of the water creepy crawlies below on the chalkboard:

Mayfly ***Mosquito*** ***Leech*** ***Planaria*** ***Sludge Worm***

Dragonfly ***Water boatman*** ***Water Snail***

With your class and using the *'More information on each of the water creatures'* pages from Activity One, write down any words that link to the animals above

E.g.



AS A CLASS, DISCUSS THE FOLLOWING QUESTIONS:

1. Which water creepy crawlies can cause ill health or disease in people?
    - *Leech, Mosquito, Water Snail*

2. What illnesses can you get from each of these?
    - *Low blood pressure, Malaria, Bilharzia*

3. If you find a sludge worm in the water, what is it telling you about the health of the water?
    - *That the water is most likely polluted.*

4. Which water creatures tell us the water is unpolluted and clean?
    - *planaria, mayfly*

5. What type of water can a dragonfly larvae live in?

6. Give 3 different ways that water can be polluted?

7. If you found two ponds of water and the one was filled with leeches, sludge worms, and mosquitos and the other had a few planaria and water boatman living in it, which one would you choose for your drinking water?
    - *Planaria pond*

8. Why is it important to ensure that the water we drink is safe to drink, wash in and use for cooking?

9. How can we help to make sure our streams and rivers are not polluted?
    - *Some examples are: We can clean up our local wetlands, rivers and streams; we can make sure we throw our waste away properly; we can write to our local councillors and municipality; we can report people and businesses who we see are polluting our rivers and streams; we can decide never to use rivers or streams as a toilet.*

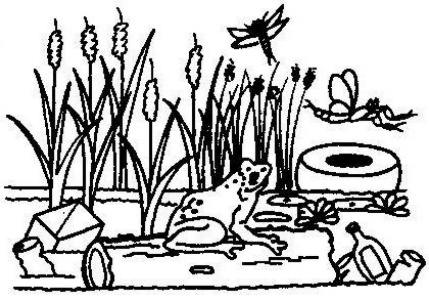
10. What can you do to make sure you do not get any diseases from water?
    - *Do not use water from dirty pools of water where cattle and human faeces (poo) can be found; boil all water first when collecting from natural healthy water sources; make sure that the water is collected from clean, fast flowing waters; do not swim and play in rivers or streams that are very close to where people live (like a town or city) and have lots of litter and rubbish lying in and around them.*

Criteria to assess learners during this life orientation lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner was able to match certain water insects with water quality (i.e. the leeches and sludge worms indicated poor water quality but the planaria and water boatman indicated good/better water quality)				
The learner was able to explain what he/she was doing				

ACTIVITY FOUR: HOW DO WE MAKE WATER SAFE TO DRINK?

This TECHNOLOGY lesson encourages learners to think about the health of water and how to make water safe to drink. It also looks at how indigenous people collected water in the past.



If possible, organise a trip to your local water sanitation plant. You will need to find out if your local water board offers guided tours of their water processing plant. If they do, ask them to focus on sanitation and how and why water is cleaned before it reaches our taps. This will help learners understand how and why water is treated before we can use it in our homes and at school. If you are unable to visit the water works, share the comic story of *'How is Tap Water Cleaned' (on page 14*) with your class.

READ THE FOLLOWING TO YOUR CLASS:

Did you know?
About 6 000 children die every day because of dirty, unhealthy water. Water that goes through a chemical and filtration process to remove the germs and dirt is the best way to treat water. In cities, water boards look after the treatment of water for people. However, in many parts of the country, away from cities, people have to collect their own water from nearby rivers and streams. Sometimes these streams and rivers are clean and unpolluted but sometimes they are dirty with lots of rubbish and disease in them.

As a class, discuss and brainstorm where and how you should collect water for your family, if you lived in a rural area with no access to piped treated water. Write down all the learners' ideas on the chalkboard

Some ideas to get the discussions going ….

We would collect water that

1. is unpolluted by livestock (cattle, goats, sheep)
2. is unpolluted by human waste (faeces, washing of clothes or people)
3. is not close to pit toilets
4. has no dead fish or other dead animals in it
5. has no litter and rubbish
6. is not close to factories that might pump waste into the river / water source
7. is not close to where you can see pipes going into the river or stream
8. is from fast flowing water sources
9. is not known to have caused any ill health in the past (community knowledge)

Once the water has been collected, how would you store it?

- Collect and store the water in clean, hygienic containers at all times.;
- Keep water containers for collecting and using water only not for other liquids such as paraffin or petrol;
- Keep water that is collected for home use in a cool, dry place.

READ THE FOLLOWING TO YOUR CLASS:

Long ago, the Nguni people collected water where they could hear it running over stones or dripping down rocks. If a spring was for human use, it was protected by a circle of rocks with a small outlet. Cattle drank elsewhere.

A water source would always be approached with care so as not to frighten crabs and other small water animals. If these small animals were disturbed, their movement would stir up sand and the person collecting the water would have to wait for the river sand to settle. The surface of the water was 'swept' with the hand and water was collected well below the surface. *(Did you know that there are higher numbers of bacteria living on the surface water of streams and ponds then there are just below the surface).*

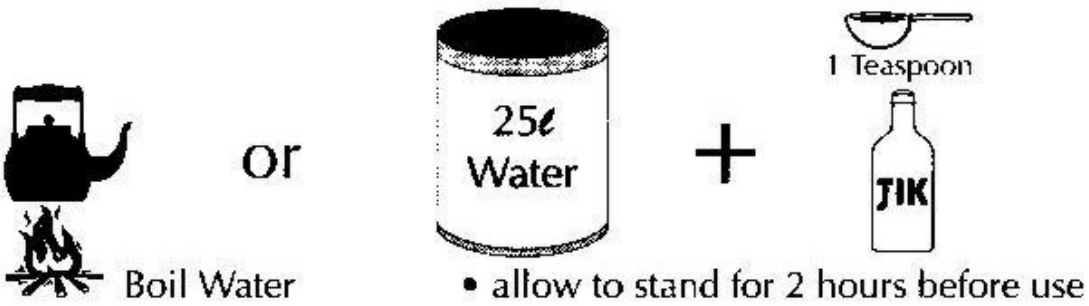
ASK THE CHILDREN:

- Have you heard or do you know of any other ways that people collected water long ago?

- Do any of you know of any simple way that you can clean (purify) your drinking water (especially if you are collecting it from a river or spring and are not sure that it is clean). *(Demonstrate to the learners the two simple ways of purifying water that follow below).*

    - A simple way of purifying water is to add a teaspoon of jik to every 25 litres of water. Jik is very strong and kills all the bacteria, making the water safe to drink.

    - You can also boil the water, and that will kill any germs or bacteria that may be living in it. The water can then be left to cool. It does not need to be drunk hot.

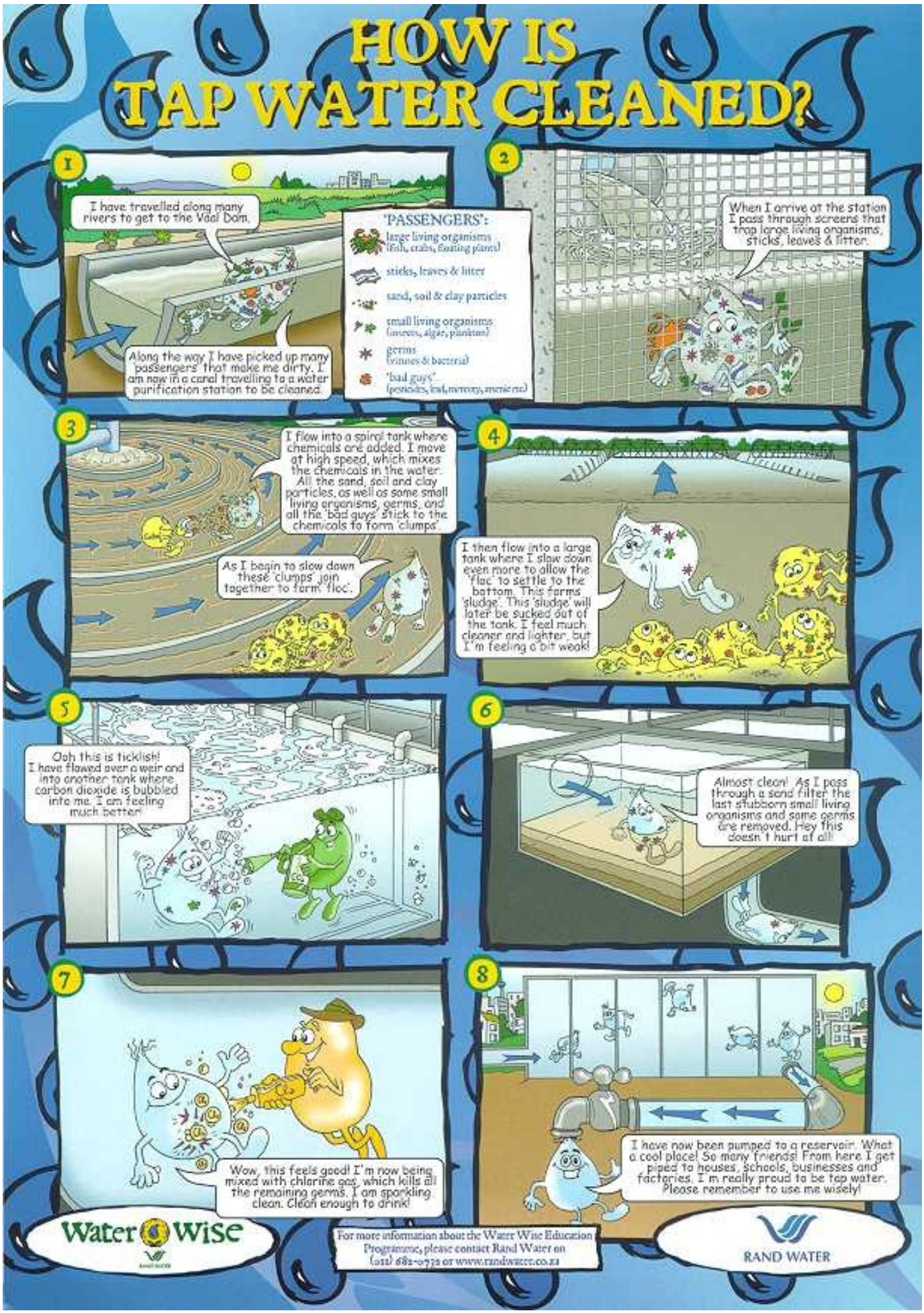


ASK THE CHILDREN:

1. To describe what you, the teacher, did during the two demonstrations.
2. Why is the water safe to drink if it is boiled or has jik in it?
3. Do they know of any other ways of purifying water?
4. Do they think a purification water works would make life easier for people? Why?

Criteria to assess learners during this technology lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner gave an opinion (yes/no) on whether a water purification works would make life easier for people				
The learner could give a valid reason as to why life was (or was not) easier for people who had to collect and purify their own water				

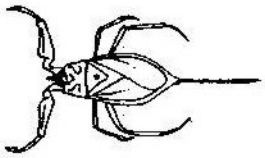

HOW IS TAP WATER CLEANED?
1
I have travelled along many rivers to get to the Vaal Dam.
Along the way I have picked up many 'passengers' that make me dirty. I am now in a canal travelling to a water purification station to be cleaned.
'PASSENGERS':
large living organisms (fish, crabs, floating plants)
sticks, leaves & litter
sand, soil & clay particles
small living organisms (insects, algae, plankton)
germs (viruses & bacteria)
'bad guys' (pesticides, coal, mercury, motor oil)
2
When I arrive at the station I pass through screens that trap large living organisms, sticks, leaves & litter.
3
I flow into a spiral tank where chemicals are added. I move at high speed, which mixes the chemicals in the water. All the sand, soil and clay particles, as well as some small living organisms, germs, and all the 'bad guys' stick to the chemicals to form 'clumps'.
As I begin to slow down these 'clumps' join together to form 'floc'.
4
I then flow into a large tank where I slow down even more to allow the 'floc' to settle to the bottom. This forms 'sludge'. This 'sludge' will later be sucked out of the tank. I feel much cleaner and lighter, but I'm feeling a bit weak!
5
Ooh this is ticklish! I have flowed over a weir and into another tank where carbon dioxide is bubbled into me. I am feeling much better!
6
Almost clean! As I pass through a sand filter the last stubborn small living organisms and some germs are removed. Hey this doesn't hurt at all!
7
Wow, this feels good! I'm now being mixed with chlorine gas, which kills all the remaining germs. I am sparkling clean. Clean enough to drink!
8
I have now been pumped to a reservoir. What a cool place! So many friends! From here I get piped to houses, schools, businesses and factories. I m really proud to be tap water. Please remember to use me wisely!
Water Wise
For more information about the Water Wise Education Programmes, please contact Rand Water on (011) 682-0732 or www.randwater.co.za
RAND WATER

ACTIVITY FIVE: IF I WAS A TADPOLE AND CAPTURED BY A GRADE 4 LEARNER ON A HOT MONDAY AFTERNOON ….

This LANGUAGES writing exercise allows learners to imagine what it would be like to be one of the water creepy crawlies that was caught during their water study in an earlier lesson!

Before starting this writing exercise with your class, discuss and brainstorm the following questions:

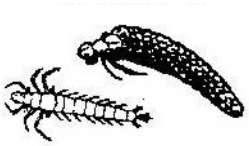
1. If you were a tiny tadpole or a water strider or any water creature (even the imaginary one that the groups created), what do you think you would do during the day?



2. What would you do at night?
3. What would you eat?
4. What would you smell?
5. What do you think you would see when you woke up each morning?
6. Would you have any friends? If yes, what would your friends be like (like you or different). If no, why not?
7. How would you feel if a Grade 4 learner scooped you out of the water and put you in a two-litre ice-cream container? (Perhaps scared, perhaps excited?)

8. What would you be thinking would happen to you?
9. How would you feel seeing all the eyes of the Grade 4 learners looking at you?
10. What would you say to the other water creatures, also in the container with you?
11. How would you feel when you were put back into the river or stream?

(During this brainstorming/questioning activity, you may wish to write down words on the chalkboard to help the learners when they write their own stories later on).



WRITING

Learners should now write a simple story of how they would feel if they were a water creature that was caught by a Grade 4 learner and then later on, released back into the water.

Criteria to assess learners during this languages lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner enjoyed listening to the story of how water was collected long ago as well as the other information on water				
The learner contributed to all the discussions during this activity				
The learner contributed to brainstorming and discussing what it would feel like to be a water creepy crawly				
The learner was able to write a creative (imaginary) piece of writing about being a water creature caught by a Grade 4 learner				

It's raining today!

Share-Net

This pack supports an introduction for learners to an Eco-School's focus on resource management

Grade 5

This pack contains:

Activity One: During this **SOCIAL SCIENCES : GEOGRAPHY** activity, learners look at the geographical distribution of rainfall across South Africa. This is linked to vegetation and farming practices as well as the spread of water-borne diseases, such as cholera.

Activity Two: During this **TECHNOLOGY** lesson, learners make an easy but accurate rain gauge, to measure the rainfall at school.

Activity Three: This **NATURAL SCIENCES** lesson looks at water in your school. Learners map out where water enters and leaves the school and areas, within the school grounds, where it is used.

Activity Four: This **MATHEMATICS** lesson looks at water use at school, home and the local community. Learners complete a quick checklist before designing their own simple data collection sheet for dripping taps around the school.

Activity Five: The Water Challenge Quiz challenges the learner to find adults and test how much they really know about one of the most important things in life – water!

WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10, which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031 (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. Learners look at the geographical distribution of rainfall across South Africa. This is linked to vegetation and farming practices as well as the spread of water-borne diseases such as cholera.	Social Sciences: Geography	**Learning Outcome 1:** Geographical Enquiry: The learner will be able to use enquiry skills to investigate geographical and environmental concepts and processes. **Learning Outcome 2:** Geographical knowledge and understanding: The learner will be able to demonstrate geographical and environmental knowledge and understanding. **Learning Outcome 3:** Exploring issues: The learner will be able to make informed decisions about social and environmental issues and problems.	• Identifies and explores possible solutions to problems [answers the question]. • Demonstrates knowledge and understanding of the issue through projects, discussion, debate and charts [communicates the answer]. • Describes ways in which the physical environment influences human activity and how human activity is influenced by the physical environment [people and the environment]. • Identifies challenges to societies and settlements with a focus on the spread of diseases [identifies the issue]. • Suggests the best way, from a range of alternatives, to reduce risks of disease [make choices].
2. Learners make an easy but accurate rain gauge, to measure the rainfall at school.	Technology	**Learning Outcome 1:** Technological processes and skills: The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.	**Makes** • Uses suitable tools and materials to make products by measuring, marking out, cutting or separating, shaping or forming, joining or combining, and finishing the chosen material. • Works neatly and safely, ensuring minimum waste of material. **Evaluates** • Evaluates, with assistance, the product according to design brief and given specifications and constraints (e.g. people, purpose, environment), and suggests improvements and modifications if necessary. • Evaluates the plan of action followed and suggests improvements and modifications if necessary.
3. Learners map out where water enters and leaves the school and areas, within the school grounds, where it is used.	Natural Sciences	**Learning Outcome 1:** Scientific investigations: The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.	**Plans investigations:** • Responds to teacher's suggestion of 'what would happen if …? **Conducts investigations and collects data: Carries out instructions and procedures involving a small number of steps.** • Records observations by drawing and labelling.
4. Learners look at water use at school, home and the local community. They complete a quick checklist before designing their own simple data collection sheet for dripping taps around the school.	Mathematics	**Learning Outcome 5:** Data handling: The learner will be able to collect, summarise, display and critically analyse data in order to draw conclusions and make predictions, and to interpret and determine chance variation.	• Makes and uses simple data collection sheets that involve counting objects in order to collect data (alone and/or as a member of a group or team) to answer questions posed by the teacher, class and self. • Draws a variety of graphs by hand/technology to display and interpret data (grouped and ungrouped) including: bar graphs.
5. Just for fun!! The Water Challenge Quiz for learners to test adults.	-	-	-

ACTIVITY ONE: IT'S RAINING TODAY!

During this Social Sciences: Geography activity, learners look at the geographical distribution of rainfall across South Africa. This is linked to vegetation and farming practices as well as the spread of water-borne diseases, such as cholera.

READ THE FOLLOWING TO YOUR CLASS:

Did you know that 75% of your body is made up of water and the longest we can go without drinking is 3 to 4 days! Water probably is the most precious resource we have on Earth. We live on a beautiful blue planet with most of the surface covered by seawater, but it is all salty and we cannot drink it. Only 2.5% of the world's water is fresh and, of that, 99% is frozen in icebergs or hidden deep in underground lakes. All South Africans, including you and me, are part of the 6.5 billion people living on the planet and we all have a responsibility to make sure that everyone gets enough fresh clean water for their needs. So, everyone needs to help keep the freshwater we have clean, and use it wisely.

South Africa is a dry country with two-thirds of it receiving less than 500 millimetres (mm) of rain per year. The world average rainfall is 857 mm. For this reason we need to appreciate and conserve our mountain catchments, rivers, lakes, and other wetland areas. They all play a vital role in providing fresh clean water for agriculture, wildlife and the people of our county.

Everyone lives in a river catchment. In the days when there were fewer people, our catchments were clean and healthy and full of life. But today, with over 6 billion people on our planet, we are quickly using up our freshwater supplies. We also pollute our water by dumping waste and pollution into our rivers and the sea.

Did you know that it takes 22 litres to make one glass of concentrated orange juice from a carton? This is because of the water used to grow the orange trees, manufacture the cartons, make the concentrated juice and then re-hydrate (add water) it. That is a LOT of water!!

WHAT TO DO:

1. Hand out a copy of Worksheet 1 to each learner.

2. Let them mark, with a cross, where they live in South Africa (it does not need to be exact, just a rough idea).

You will need to explain to the learners the rainfall pattern across the country, using the worksheet and the key – lots of rain in the extreme east, very little rain in the west.

3. Learners can now colour in the worksheet showing rainfall distribution – (*colour in the area which gets the most rain, a dark blue, getting lighter and lighter blue as less rain falls, eventually using yellow or brown pencil crayons in areas with very low rainfall [in the west]).*

QUESTIONS TO ASK THE CLASS:

1. What part of the country (the wetter part or the drier part) do we live in? Do you have any friends or relatives who live in other parts of the country? Looking at your coloured in worksheet, do your friends and family live in an area that gets more or less rainfall than you?

2. If you were a mealie farmer, where would you want to live to grow your mealies successfully and why?

3. What types of plants do you think you would find in the western part of South Africa? *(Plants that don't need much water – perhaps aloes, cactuses).*

4. What kind of plants do you think you would find in the eastern part of the country? *(Plants that need lots of water).*

For questions 2, 3 and 4, it may be useful to have available a collection of library books on agriculture, farming and gardening in South Africa.

READ THE FOLLOWING TO YOUR CLASS:

The rain that falls across South Africa feeds our streams and rivers. Many people in our country use this water for different reasons – the mealie farmer pumps water from the nearby river to irrigate his crops, children swim and have fun in the water, women wash their clothes in the water, some people collect water to take it home for drinking and cooking, water boards build dams to collect the water and then use it to supply tapped water to people who live in towns and cities. Can you think of any other ways that the rain water falling into our rivers and stream is used?

Look at the picture below:

ASK YOUR CLASS:

1. What do you see?

2. If you wanted to go for a swim in this river, where would you go to swim (upstream or downstream)? Why?

Many germs that make people very sick can be found in the faeces (poo) of infected people, who have diseases like cholera and dysentry. These germs multiply quickly in water. Rain will wash the faeces of the woman who is going to the toilet near the river, into the water. If she has a disease like cholera (which gives people a runny tummy and makes them feel very sick and weak), it will get into the river, the germs will multiply and other people using the river, downstream, may get the disease as well! Many people wash their clothes in the river. If they are also washing nappies of babies who have diseases, the germs will get into the river.

Glossary of terms:

- Dysentry – a severe diarrhoea (loose or watery poo) illness often associated with blood in the faeces (poo). It is caused by eating food which contains bacteria
- Cholera – a disease of the stomach which gives people a runny tummy and makes them feel very sick and weak and want to vomit
- Multiply – increase
- Infect – pass on a disease
- Diseases – illness, infection, bad health
- Germs – micro organisms (too small to see) that will make you sick

QUESTIONS TO ASK THE CLASS:

1. What do you think the people in the picture could do so that their actions don't make other people sick?
    - *wash clothes away from the river, in other words, carry buckets of water away from the river to use for washing, not wash directly in the water;*
    - *build toilet far away from water sources;*
    - *do not go to the toilet close to or in a river or stream.*

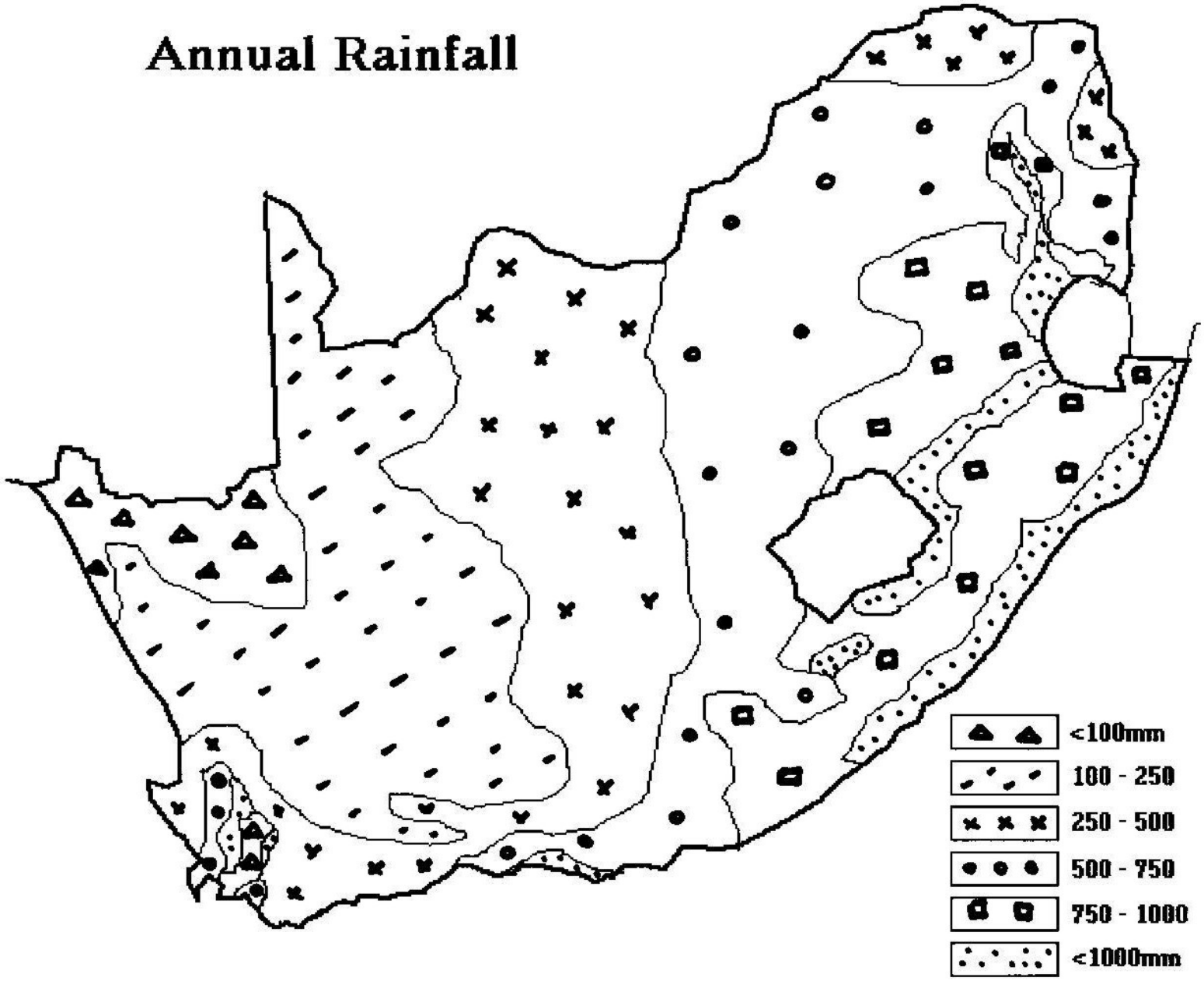
2. What can we do to make sure that our daily actions do not contribute towards making other people sick or polluting our rivers and streams?

Criteria to assess learners during this social sciences: geography lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
With the help of the teacher, the learner was able to draw a cross on the map, roughly in the region where they lived				
The learner was able to answer the question as to where a farmer would choose to grow crops				
The learner saw the problems of sanitation issues				
The learner was able to contribute solutions as to what the women in the picture could do to prevent spreading diseases to other people				

Worksheet 1

Name:.....



ACTIVITY TWO: LET'S MAKE A RAIN GAUGE

During this TECHNOLOGY lesson, learners make an easy but accurate rain gauge, to measure the rainfall at school.

One of the ways we can measure how much rain falls in our area is by using a rain gauge and recording the rainfall daily. Learners need to work neatly, safely and carefully, ensuring minimum wastage of materials.

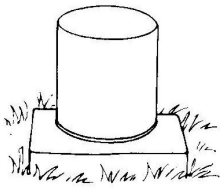
Let's make our own tin can rain gauge

Each learner will need:

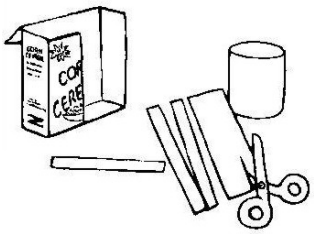
- Tin can
- Breakfast cereal packet
- Glue
- Scissors
- Ruler
- Pencil

WHAT TO DO:

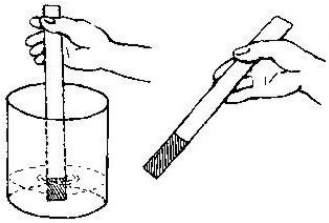
1. Put an empty tin on a flat surface out in the school grounds, well away from overhanging trees, shrubs and sprinklers.



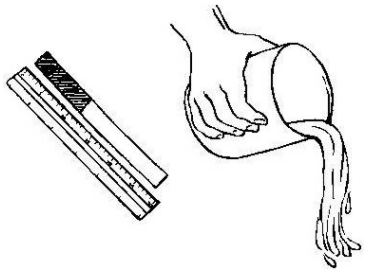
2. Make some rain dipsticks by cutting long 1cm-wide strips from the breakfast cereal box. The sticks must be longer than the height of the can.



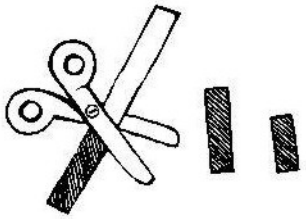
3. With your class, at the same time each day, measure the rainfall by dipping the dipstick into each can so that they touch the bottom. See how the rain leaves a wet mark on the cardboard.



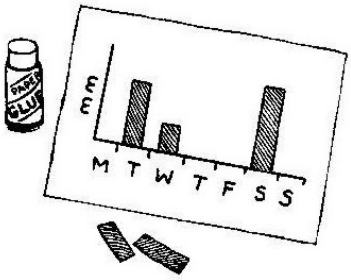
4. Use a ruler to measure the length of the wet part of the cardboard in millimetres – this is how much it has rained. Empty the cans.



5. Cut the wet piece off the dipstick and let it dry. Keep it flat and write the date and rainfall in millimetres on it.



6. When the piece of dipstick is dry, make a chart of the rainfall for a week. Glue each piece to paper to form a record of rainfall at your school.



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You may decide to place the tin can rain gauges in different places around the school to see if there is any difference in rainfall within the school grounds.

Note: if possible, ensure that the learners choose tin cans deep enough to hold an average day's rainfall for your area. The can must not have a rim that makes the mouth narrower than the base.

ASK THE CLASS:

1. Do you think our rain gauges worked well?

2. Could they have worked better? How?

3. Were our results accurate? (you, the teacher, can find out the correct rainfall figures for your area for that particular week, by contacting the local Weather Bureau).

4. If some of your learners live a distance from the school, why not get them all to make a rain gauge for their gardens at home and record the rainfall during the holidays or over a long weekend. You and your class can then plot and compare the different rainfall amounts on a map of your area.

Criteria to assess learners during this technology lesson

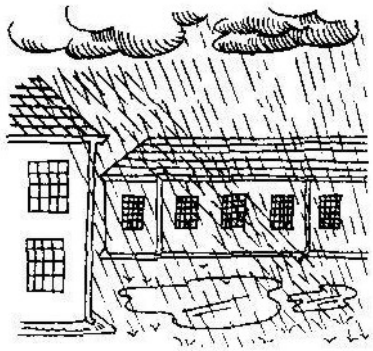
Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner worked neatly and safely when making his/her rain gauge				
The learner cut out 1 cm-wide strips for rain dipsticks				
The learner discussed (evaluated) how they had made their rain gauge				
The learner made a chart to show rainfall at school over a one-week period				

ACTIVITY THREE: A WATER STUDY AROUND OUR SCHOOL

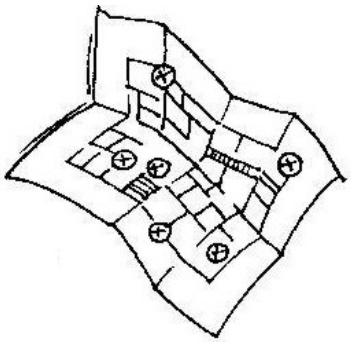
This NATURAL SCIENCES lesson looks at water in your school. Learners map out where water enters and leaves the school and areas, within the school grounds, where it is used.

Teacher, before you start this activity, find out where your school's water meter is located. Try to get plans of where the water pipes are in the school and the latest water account. These will be useful to show the learners during this lesson.

GET THE LEARNERS TO:



1. Sketch a plan of the school and show where:
    - the water supply enters the school (if there is no piped water, show the water tanks or where water for school use is stored);
    - the water is used (such as toilets, swimming pool, playing fields, gardens, outside and inside taps).



2. Sketch on your plan where the water goes to, after being used (include waste water, rain water, hose water run-off).
3. Look along the street to see where the gutters go. Where are the stormwater drains? What happens to the water when it rains? Does water lie around the playgrounds or playing fields?
4. Find out how much water the school uses in a month. Find out how much this water costs.

LEARNERS, WORK OUT:

- If 12 litres of water is used every time a toilet is flushed, how much water would be used if every learner in the school went to the toilet once a day?
- Make a list of ten ways you use water at school. Now imagine that there is a shortage of water and cut out five of the ways you use water. Which would you cut? How might this affect the school?

TEACHER, WITH YOUR CLASS:

a. Discuss all the ways the learners use water at school. List them on the chalkboard.

b. Discuss practical and possible ways that you think your school could reduce the amount of water that is being used and so save water. List these on the board.

c. Discuss practical and possible ways in which you, the teacher, and the learners can reduce the amount of water you use. List them on the chalkboard. Let everyone choose one and see what happens over the following week. *(Some ways we can all reduce the amount of water we use is to have shorter showers or make sure we don't fill the bath too much; turn off taps when brushing our teeth; washing our cars and bicycles using a bucket, not with a running hosepipe; watering our flower and vegetable gardens during the early morning or late evening; asking our parents to fix leaking taps in and around our homes).*

Criteria to assess learners during this natural sciences lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner was able to follow instructions and draw a map of the school				
The learner was able to mark the places on their map where water is used				
The learner was able to contribute to discussions of what would happen if there was a water shortage				

ACTIVITY FOUR: ARE WE WASTING OUR WATER AT SCHOOL, HOME AND IN OUR COMMUNITY?

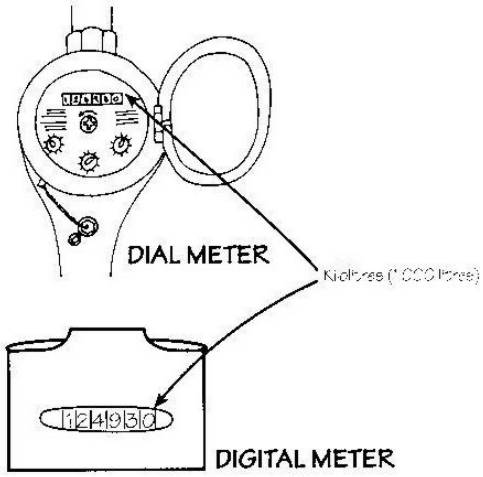
This MATHEMATICS lesson looks at water use at school, home and the local community. Learners complete a quick checklist before designing their own simple data collection sheet for dripping taps around the school.

ACTIVITY FOR THE LEARNERS:

- Give each learner the checklist on the following page to do a quick check of local patterns of water use at school, in and around their home and in their local community. They need to tick bad and good practices. *This activity can be done as a homework exercise.*
- Discuss the 'good' and 'bad' practices that they observed in their own homes and in their community and make a tally on the chalkboard of all the actions *(e.g. long showers with big nozzle – 16; big cistern with slow leak – 7; low-flow shower with stop switch – 8; bottle or bag in cistern or dual flush – 4).*

ACTIVITY:

1. Take your class for a walk around the school. Does your school have a water meter? Show the learners where the municipal workers read the meter each month. Let them see the water account from the municipality. If your school does not have piped water, where do you get your water? Perhaps at a community stand-pipe or pump or maybe your school collects rainwater? Show the children where the rainwater tanks are.



2. Next, walk around the school grounds. Can the children see any signs of wasteful water use? Continue around the school grounds – can the learners see any leaking taps? Send someone into the toilets – did they see any leaking taps or overflowing toilets?

TIME TO HEAD BACK TO THE CLASSROOM:

- Get each learner to design a simple sheet which will be a record of any water wastage in the school. *(An example is given on the next page – this is NOT for the children to use but to give you, the teacher, an idea of what the record sheet should look like. The children may put in more or less detail if they wish).*

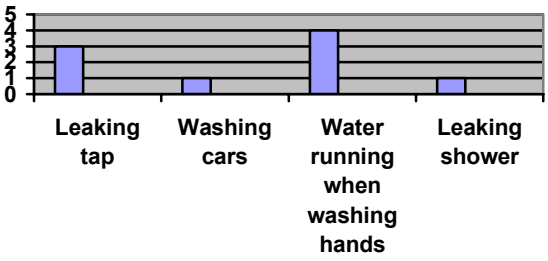
Day	Date	Time	What I saw
e.g. Monday	*31 January*	*7.45am*	*A dripping tap near the boys toilets*
Monday	*31 January*	*10.15am*	*A teacher washing his car at break using a hosepipe with lots of water being wasted.*
Monday	*31 January*	*13.50pm*	*My friend let the water run when she was washing her hands. Lots of water was wasted.*
Monday	*31 January*	*14.00pm*	*I saw a leaking tap near the sport field*

Let the learners keep a record for an entire school day, starting from when they arrive at school, before lessons start, until the end of the day, after sport in the afternoon. They must remember not to record the same leaking tap twice!!

AS A CLASS DISCUSS:

1. What were the results? Discuss these and list them on the chalkboard.
2. Let each learner draw a bar graph showing where water is wasted in the school *(see example below).*

Water wastage at our school



3. What could the school do to stop water being wasted?
4. What can we do to stop water being wasted?

Criteria to assess learners during this mathematics lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner made a simple record sheet to gather information about water wastage at school				
The learner used their record sheet to collect data of water wastage				
The learner drew a bar graph showing water wastage in the school				

ACTIVITY FIVE: JUST FOR FUN!! FOR ADULTS ONLY!

The Water Challenge Quiz challenges you, the learner, to find adults and test how much they really know about one of the most important things in life – water! This test is given to adults (like your parents, aunts and uncles and adult family friends) by you. Test as many adults as you can, add up the scores and give the adults a report card.

Take the challenge!

Make copies of this quiz and test as many adults as you can!

Correct each adult's quiz using the answers given after the quiz.

QUESTIONS

1. The largest river in South Africa is the
   a) Orange b) Vaal c) Limpopo

2. South Africa's average annual rainfall is less than _____ per year.
   a) 200 mm b) 300 mm c) 500 mm?

3. Global warming will cause sea levels to rise because water expands when it is heated?
   a) True b) False

4. The water and other fluids we pour down our drains end up in
   a) drinking water b) rivers c) oceans d) all of these?

5. The Orange River flows from the Drakensberg into
   a) Alexander Bay b) Vaal River c) Namibia

6. Each time we flush the toilet we use _____ litres of water?
   a) 12 b) 24 c) 30

7. The _____ river has the largest watershed in the world?
a) Nile b) Amazon c) Mississippi

8. The Orange River's name is derived from the colour of the river?
a) True b) False

9. The majority of the Earth's freshwater is stored in _____ form?
a) solid b) liquid c) gas

10. _____% of the Earth is covered with water?
a) 50% b) 70% c) 90%

Sink or swim?

Over 8 correct ….. Swimming!
Over 5 correct ….. Bobbing!
Under 5 correct … Sunk!!!!



Answers to the quiz

1. a 2. c 3. a 4. d 5. a 6. b 7. b
8. b – it is believed to be named after the Duke of Orange 9. a 10.b

The water cycle in nature and the water cycle in me!

Share-Net

This pack supports an introduction for learners to an Eco-School's focus on resource management

Grade 6

This pack contains:

Activity One: During this **LANGUAGES** lesson, learners find out some amazing facts about water, and practise their reading, listening and speaking skills.

Activity Two: Read the facts, then do the sums!! This **MATHEMATICS** lesson focuses on word sums, number sentences, fractions, time and measurement – all with a watery wet focus!

Activity Three: This **SOCIAL SCIENCES: GEOGRAPHY** lesson takes learners through the waterways of Africa, starting in the Cape and heading north to Cairo!! As they navigate their journey, they will work out longitude and latitude co-ordinates.

Activity Four: This **NATURAL SCIENCES** lesson looks at a water catchment. Learners consider taking some positive environmental action to help our precious water catchments and then trace the path of water, starting from their taps (or water tanks) at school or home, back to the source.

Activity Five: This fun **TECHNOLOGY** activity can be done in the classroom or at home. For learners who may struggle with this, there are instructions for an easier 'tin can rain gauge' in Activity 2 of the Grade 5 pack.

WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10, which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031 (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. Learners find out some amazing facts about water, and practise their reading, listening and speaking skills.	Languages	**Learning Outcome 2:** Speaking: The learner will be able to communicate confidently and effectively in spoken language in a wide range of situations. **Learning Outcome 3:** Reading and viewing: The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts. **Learning Outcome 4:** Writing: The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes. **Learning Outcome 5:** Thinking and reasoning: The learner will be able to use language to think and reason, as well as to access, process and use information for learning.	Uses appropriate body language and presentation skills. • Does not turn back on audience; • Varies volume, tone and tempo of voice for emphasis and effect. Interprets and analyses independently details in graphical texts and transfers information from one form to another. Writes and designs visual texts clearly and creatively using language, sound effects, graphics and design for different audiences. Changes format of information (e.g. from tables into written form, tables to graphs).
2. This lesson focuses on word sums, number sentences, fractions, time and measurement.	Mathematics	**Learning Outcome 2:** Patterns, functions and algebra: The learner will be able to recognise, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills. **Learning Outcome 4:** Measurement: The learner will be able to use appropriate measuring units, instruments and formulae in a variety of contexts.	• Writes number sentences to describe a problem situation, including problems within contexts that may be used to build awareness of human rights, social, economic, cultural and environmental issues. • Solves or completes number sentences by inspection or by trial-and-improvement, checking the solutions by substitution. • Reads, tells and writes analogue, digital and 24-hour time to at least the nearest minute and second. • Uses appropriate measuring instruments to appropriate levels of precision including bathroom scales, kitchen scales and balances to measure mass.
3. Learners journey through the waterways of Africa, starting in the Cape and heading north to Cairo!! As they navigate their journey, they work out longitude and latitude co-ordinates.	Social Sciences: Geography	**Learning Outcome 1:** Geographical enquiry: The learner will be able to use enquiry skills to investigate geographical and environmental concepts and processes.	Locates relevant places on maps using latitude and longitude (degrees and minutes).
4. Learners consider some positive environmental action taking to help our precious water catchments and then trace the path of water, starting from their taps (or water tanks) at school or home, back to the source.	Natural Sciences	**Learning Outcome 2:** Constructing science knowledge: The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.	**Understands the impact of science and technology** • Uses personal observation or information from the local authority to flowchart the water supply system from the taps (or water tank) back to the source, noting points of potential contamination.
5. Just for fun – making a bottle rain gauge.	Technology	-	-

ACTIVITY ONE: THE WATER CYCLE IN NATURE AND THE WATER CYCLE IN ME

During this LANGUAGES lesson, learners find out some amazing facts about water, and practise their reading, listening and speaking skills.

ACTIVITY:

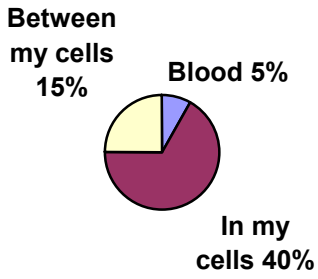
1. Divide the class into groups of 4 or 5 learners. Each learner will need a photocopy of 'Two Water Cycles', which can be found on page 3.

2. Learners need to read the 'Two Water Cycles' silently, to themselves.

3. Next, each learner must take a turn to read aloud to the rest of their group. *Remind the learners to vary their tone and tempo of voice for emphasis to make the listening for the other learners more enjoyable. Learners must also take note of question marks and exclamations in the text and vary their voices accordingly. They also need to read in full, any abbreviations such as 'ybw' which stands for 'your body weight'. You, the teacher, will need to move between groups, checking that the children are following these instructions.*

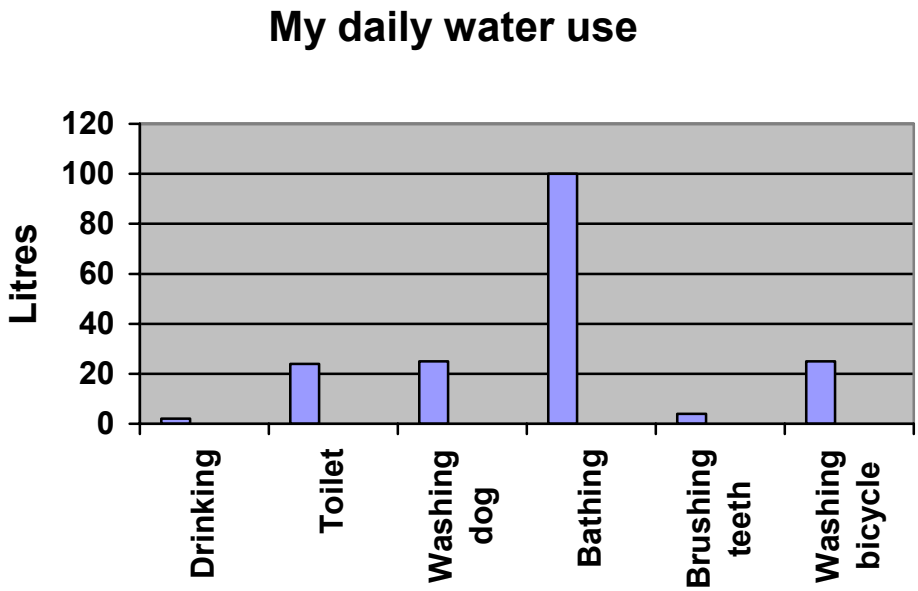
4. Using the information given in the reading, learners now need to make a pie chart showing where water is stored in our body *(see pie chart below).*

Water stored in my body as a % of my body weight



5. How else can the information given in the reading about how water is stored in our body be displayed in a creative way? Learners need to creatively design a book cover with text and graphics (the book is called "Water in the human body"), using the factual information given in the 'Storing Water' paragraph on page 3.

6. Using the bar chart given below, learners must interpret the information given and write a short paragraph *(in other words they need to transfer the information they are given in the bar chart to another form, in this case, written text).*



TWO WATER CYCLES

There are many different cycles in nature, but the most important one is probably the water cycle, as this gives life to our planet. Find out more about "the water cycle in nature" and "the water cycle in you".

THE WATER CYCLE IN NATURE

Energy to go
The warmth of the sun's rays drives Nature's water cycle. Here's how:

1. The heat from the sun evaporates water, mainly from the sea, to form water vapour.
2. The vapour cools as it rises into the sky, and forms tiny water droplets that group to form clouds.
3. As they get colder the droplets join to make larger drops that fall as rain.

Fact: It has been calculated that all the Earth's water may have been through the water cycle over one million times since the oceans first formed.

Drinking water
Most of the Earth's water is either salty or frozen in the polar ice caps. Less than 1% is available as fresh drinking water for all the plants, animals and people on the planet!

Transporting water
Rivers and groundwater transport rainwater back to the sea. The water carries dissolved nutrients, air, soil particles and debris downstream, and finally into the sea.

Storing water
Mountain wetlands seep stored rainwater and release it slowly to rivers. Lakes and reedbeds lower in the catchment, also slow down and store rainwater run-off, reducing soil erosion and flooding. Rain that sinks into the ground is stored in aquifers – water-filled spaces in rocks and sand underground.

Cleaning water
The soils, plants and micro-organisms in wetlands absorb nutrients, debris and pollutants and release cleaned water to our rivers.

The freshwater discharge centre
Rivers carry rainwater run-off to estuaries and the sea. Groundwater discharges into rivers or directly into the sea.

The water users
People, plants and animals all rely on Nature's water cycle to provide fresh, clean water.

Are there water leaks?
None – it all stays on our planet.

THE WATER CYCLE IN YOU

Energy to go
Food fuels your body and its water cycle. If you eat nourishing foods then your body cells can work efficiently and keep you healthy.

Drinking water
Our drinking water comes from rivers or rain stored in tanks, dams or underground aquifers. It is then purified and piped to taps in our homes. However, more than one third of South African homes still don't have taps.
Fact: South Africa has nearly 48 million people, all of whom need to consume about 2 litres of clean water each day to stay healthy.

Transporting water
Our blood vessels are like rivers that carry watery plasma, blood cells, nutrients and oxygen to all our body cells which are the tiny factories that keep us going.

Storing water
Your body stores water in the blood (5% of your body weight (ybw)), in your cells (40% ybw) and between the cells (15% ybw). Your body needs this amount of water to function properly.
Fact: Your body is two-thirds water – if you weigh 30kg you are carrying 20 litres (80 cups!) of water inside you!

Cleaning water
The blood carries body waste products to the kidneys. They clean your water system and expel waste in your urine.
Fact: The kidneys of an adult filter 180 litres of liquid each day. Most is reabsorbed, so you wee only about one litre.

The freshwater discharge centre
The bladder stores waste water until you offload it into the toilet.

The water users
All body cells use water for their chemical reactions. Our lungs and noses use water to make mucus, and our digestive systems make, and then reabsorb, about 7 litres of mucus and enzymes while digesting food each day.

Are there any water leaks?
Yes – we have very leaky bodies. We lose about 1.6 litres of water each day through urine (1.2 litres), breath and sweat (0.2 litres) and poo (0.2 litres).
Fact: You will lose more water if you are doing hard exercise or living in a very hot climate. Remember to drink more water when it is hot.

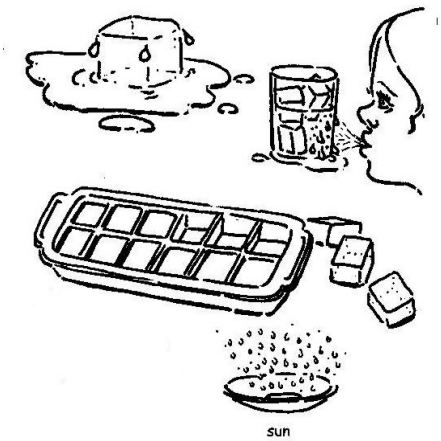
Criteria to assess learners during this languages lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner faced the group when he/she was reading				
The learner varied his/her tone and tempo of voice when reading to the group				
The learner was able to draw a pie chart from the information given in the text (question 4)				
The learner was able to design a book cover, with text and graphics, using the information given in the 'Storing Water' paragraph				
The learner was able to write a paragraph using the information given in the bar graph (question 6)				

ACTIVITY TWO: WATERY WORD SUMS, NUMBER SENTENCES AND FRACTIONS

Read the facts, then do the sums!! This MATHEMATICS lesson focuses on word sums, number sentences, fractions, time and measurement – all with a watery wet focus!

WATER FACT FILE



Water disguises

- 70% of the Earth's surface is covered in water. The water comes in 3 forms: liquid water droplets, a gas called water vapour, and solid ice crystals. It changes form by melting, freezing, evaporating or condensing.

Underwater cities?

- If all the Earth's ice sheets and glaciers melted, the sea would rise by 60 to70 metres and flood our coastal cities.

Water power

- Running water wears away soil and rocks. The Niagara River between Canada and the United States of America plunges over a waterfall nearly 55 m high, and is cutting into the soft rock at a rate of one metre a year! The falls have moved 11 km upstream over the last 10 000 years! In many countries waterpower is used to generate electricity.

Alien water wasters

- Alien trees like wattles and pines growing in our river catchments absorb and use as much as 61% of the rain that falls on them. Indigenous fynbos plants use only 6% and the rest is left to seep into our rivers. So … grow indigenous!

Dams make us wobble!

- The dams and canals built over the last 100 years have altered the distribution of freshwater on our planet. This has led to a small change in the wobble of the Earth as it spins!

Amazing animals

- A frog that lives in the Central Australian Desert hibernates underground and only comes out every 5 to 6 years when it rains. Then it drinks half its weight in water so that it looks like a small balloon!

Making cars, and even eggs, uses water

Making goods and growing food uses lots of water:

- 450 000 litres to make one small car

- 1 000 litres for one Sunday paper
- 9 500 litres to grow half a kilogram of beef
- 1 000 litres for a kilogram of maize
- 150 litres for an egg!

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ACTIVITY: SOLVE THE NUMBER SENTENCES

Example: 2×□–4=16 Answer: 10

Remember: Brackets, multiplication and division are always done **BEFORE** addition and subtraction.

A

1) 7÷□–1=0

2) 18×2–6+□=31

3) 8÷4÷□=1

4) 17x2÷1x3=□

5) 1×□+999=999

6) 54÷□÷9=3

7) 110–□+25=128

8) 1000–□+3=10

9) 67×□+5629=6299

10) 536÷□–65=2

11) (17×2)–18+(6÷2)+9=□

12) 4×8×1÷2÷8×□=2

13) (15×3)+22–(29×1)–(8÷□)=34

14) □+50–(50÷50)–49+(50×2)=200

15) □+9-7x22-11=0

B The area below represents a river catchment. You read earlier that nearly two thirds of the rain that falls where alien plants have grown, is used up by these alien plants. Using a coloured pencil or highlighter, shade in the amount of water left over to seep into our rivers and streams.

C The following activity focuses on word sums and their corresponding number sentences. Two examples of word sums and their number sentences are given below.

Example 1 **Word sum:** An adult needs 2 litres of water each day. How many litres of water will she need in a week?

Number sentence: $2 \times 7 = 14$

Example 2 **Word sum:** A woman walks to a river to collect water for washing her family's clothes, for drinking and for cooking. On the first day she walks $2^1/_8$ km. On the second day, she sees a crocodile at the same place so walks another $5^3/_8$ km to collect water from a safer spot. On day 3, the water tanker arrives in her village so she does not need to fetch water. On day four she decides to walk in the opposite direction to see if there is a water source closer to her. If the total distance she walked in the four days was 12 km, how far did she walk on the fourth day and was this water source closer?

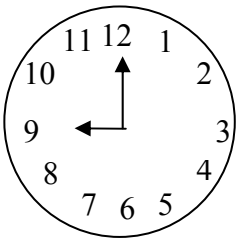
Number sentence: $2^1/_8 + 2^1/_8 + 5^3/_8 + 0 + 2^3/_8 = 12$ km and no, the water source was not closer, the first water source was.

Did you know? $^4/_8$ can be written as $^1/_2$.

It is now your turn to write 5 word sums and 5 number sentences about water. Use the information provided at the beginning of this Activity to make up some exciting and interesting word sums!

D TIME TO TELL THE TIME!!

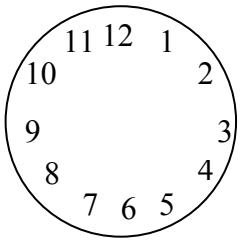
Show your answer on the two clock faces below:
For example, a Midmar Mile swimmer takes 45 minutes and 30 seconds to get across Midmar Dam during the annual water race. If she started the race at quarter past eight in the morning, what time would she get to the other side of the dam and finish the race?



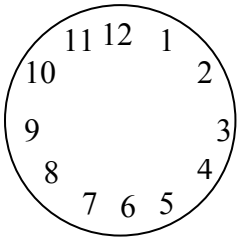
$09:00^{30}$

Note: *The hour hand is always shorter than the minute hand*

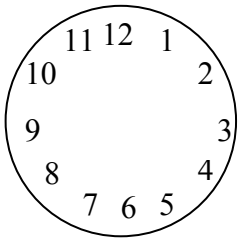
1) It takes five hours, 20 minutes and 10 seconds to walk to the bottom of the Karkloof Waterfalls. If two friends start walking at half past two in the afternoon, what time will they get to the bottom of the falls?

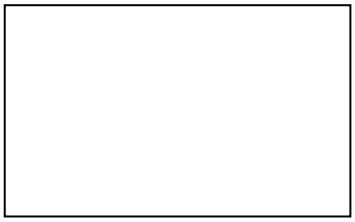


2. A factory owner pumps pollutants into a nearby river at a quarter past one in the morning. Three hours, 15 minutes and 22 seconds later he is caught by the police. At what time is the factory owner caught?

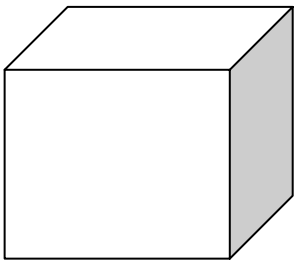


3. A group of adults go on river cruise at 8:35pm. The cruise finishes 9 hours, 12 minutes and 16 seconds later. What time will they get off the boat?





Bonus Question!!!!!



The cube above has a length, breadth and height of 5 cm

a. Calculate the volume of the cube

b. Calculate the surface area of the cube

TRY THIS AT HOME!! FUN HOMEWORK ACTIVITIES USING MEASURING INSTRUMENTS:

- **A Bathroom Scale:** Use your scale at home to measure
  - (1) Your weight
  - (2) Your brother's / sister's weight and
  - (3) Your dog's / cat's weight.
  - Write down your answers in kilograms and next to each write your answer in grams.

ANSWERS TO MATHEMATICS QUESTIONS IN ACTIVITY TWO

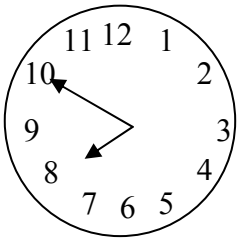
A

1) 7	2) 1	3) 2	4) 102
5) 0	6) 2	7) 7	8) 993
9) 10	10) 8	11) 28	12) 1
13) 2	14) 100	15) 156	

B

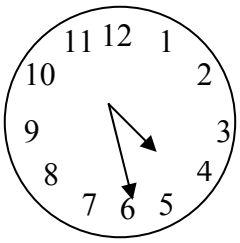
D

1)



19:50[10]

2)



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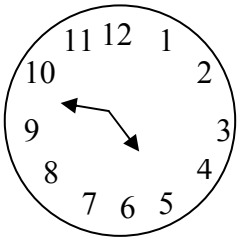
3)



05:47[16]

Bonus question:

(a) 125 cm^3 (b) 150 cm^2

Criteria to assess learners during this mathematics lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner solved the number sentences				
The learner developed five word sums				
The learner developed five number sentences				
The learner wrote analogue, digital and 24-hour times on the clocks provided				

ACTIVITY THREE: FROM CAPE TO CAIRO

This SOCIAL SCIENCES : GEOGRAPHY lesson takes learners through the waterways of Africa, starting in the Cape and heading north to Cairo!! As they navigate their journey, they will work out longitude and latitude co-ordinates.

Equipment needed for each learner or group:

- An atlas
- Pens, pencils and paper
- An A4 map of Africa showing the major rivers (use map on page 13)
- Cotton for measuring distances

What to do:

This activity requires that groups (or individuals) travel from Cape Town to Cairo along all the waterways of Africa. The idea is that participants plan a route through Africa which will be carried out using a Landrover and a small boat. The learners must plan their journey to incorporate as many of the waterways as possible. This can include the sea but learners should be encouraged to avoid using the sea in favour of the land routes. *(Do not worry about mountain ranges and deep valleys – measure the route as if the route from the Cape to Cairo was flat).*

Once the learners have mapped out their route which will mean using both the atlas and the A4 map, they must calculate the distances they have travelled over:

Land : number of kilometres travelled in the Landover
Sea : number of kilometres travelled on the sea
Water : number of kilometres travelled (rivers and lakes and dams)

The “winner” will be the learner or group who has travelled the shortest distance over land, in other words, who has used the rivers and lakes of Africa for travel.

Remember that when learners are using an atlas to calculate the distances, they need always to take note of the scale of the map.

QUESTIONS FOR EACH LEARNER / GROUP: WRITE THE ANSWERS DOWN

1. List all the countries through which you travel.
2. List all the capital cities of the countries through which you travel.
3. Give the longitude and latitude (degrees and minutes) for these cities.
4. Name 10 of the rivers you travelled.
5. Using the atlas, which was the area/country of highest rainfall?
6. Using the atlas, which was the area/country of lowest rainfall?
7. What did you notice about the vegetation as you travelled north?
8. What was the most dangerous thing that happened during your journey? (be as creative and imaginative as you can!!)
9. What the kindest thing you or your group did during your Cape to Cairo journey?

You, the teacher, may wish to discuss all the answers to the questions in class after the groups have written down their answers. You could also take this work in, mark it, and add it to the learners' portfolios.

Criteria to assess learners during this social sciences : geography lesson

Criteria	**Exceeded requirements of the Learning Outcome**	**Satisfied requirements of the Learning Outcome**	**Partially satisfied requirements of the Learning Outcome**	**Not satisfied requirements of the Learning Outcome**
The learner gave the longitude and latitude for each capital city of each African country they travelled through				

a) Land - number of kilometres travelled in the Landrover =

b) Sea - number of kilometres travelled on the sea =

c) Water - number of kilometres travelled (rivers, lakes and dams) =

ACTIVITY FOUR: WHERE DOES OUR DRINKING WATER COME FROM?

This NATURAL SCIENCES lesson looks at a water catchment. Learners consider some positive environmental action taking to help our precious water catchments and then trace the path of water, starting from their taps (or water tanks) at school or home, back to the source.

RIVER CATCHMENTS

The river catchment, or drainage basin, is all the land from mountain top to seashore, drained by a single river and its tributaries.

Catchment areas vary greatly in size – a big river may have a catchment area of several thousand square kilometres, whereas a smaller tributary will have a catchment area of only a few hectares. Catchments are separated from one another by watersheds.

Waterbodies in southern Africa suffer from many problems – all of which are linked to the way in which the catchment area of each is used. Catchment conservation should include the protection of wetlands and sound conservation practices on agricultural and forestry lands (such as all ploughing and planting should be on the contours, river-bank vegetation should not be disturbed, and there should be the prevention of water pollution from industry, agriculture or informal settlements).

ACTIVITY:

People are realising that we must protect our precious rivers and streams and many folk across South Africa have started 'adopt a river' projects. As a class or in groups discuss the positive action plans that you can see in the river catchment below:

For the teacher: Some of the positive action projects in the water catchment are:

1. Organising litter clean-ups
2. Recycling waste
3. Removing alien invasive plants
4. Replanting river banks
5. Keeping strips of wetland between the river and the gardens
6. Fixing dongas
7. Repairing damaged wetlands
8. Fencing and protecting springs
9. Building houses and toilets well away from river banks
10. Keeping farm animals away from river banks

ACTIVITY (GROUPWORK OR INDIVIDUALLY):

1. Using your own personal observations, the picture on the previous page and the comic strips at the end of this activity, trace the water we drink everyday from our taps or water tanks, back to the source.

2. Your information must be in the form of a flow-chart.

3. Make notes, on your flow-chart, of where possible contamination of the water takes place.

AS A CLASS:

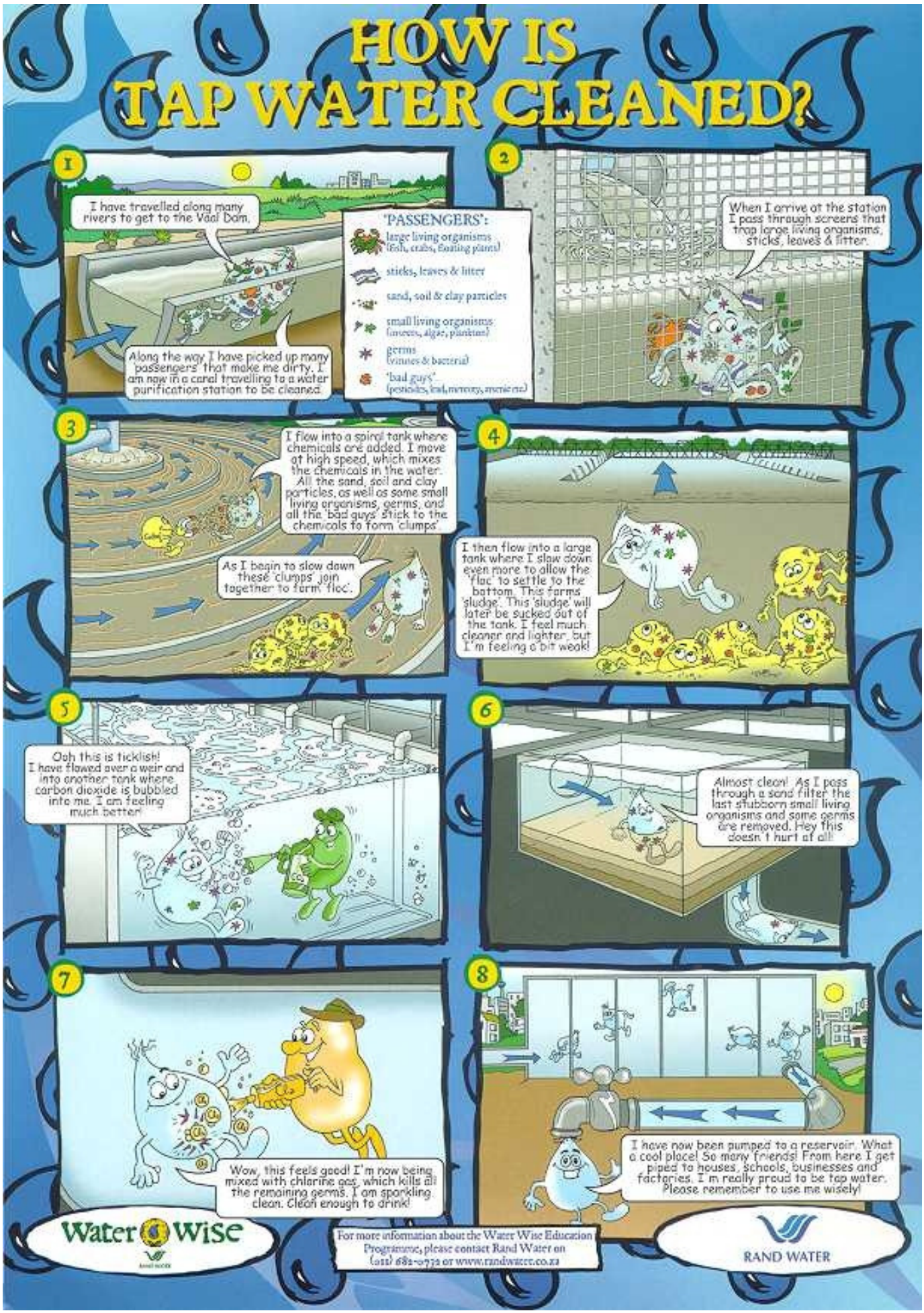
1. Discuss the journey of water from our taps, back to the source. Teacher, use all the information from the different groups to draw a comprehensive flow-chart on the chalk board.

2. Where did learners feel contamination could take place? Discuss this, putting all the possible contamination points on the flow-chart.

3. What environmental action could be taken to address these issues?

Criteria to assess learners during this natural sciences lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner took part in the discussion around the positive environmental actions they could see happening in the catchment				
The learner used a flow-chart and traced the journey of water from where it is drunk to its source				
The learner contributed to discussions on how water could be contaminated between where it is drunk and the source				
The learner contributed ideas of what one could do to address the contamination of water				


HOW IS TAP WATER CLEANED?
1
I have travelled along many rivers to get to the Vaal Dam.
Along the way I have picked up many 'passengers' that make me dirty. I am now in a canal travelling to a water purification station to be cleaned.
'PASSENGERS':
large living organisms (fish, crabs, floating plants)
sticks, leaves & litter
sand, soil & clay particles
small living organisms (insects, algae, plankton)
germs (viruses & bacteria)
'bad guys' (pesticides, coal, mercury, arsenic etc)
2
When I arrive at the station I pass through screens that trap large living organisms, sticks, leaves & litter.
3
I flow into a spiral tank where chemicals are added. I move at high speed, which mixes the chemicals in the water. All the sand, soil and clay particles, as well as some small living organisms, germs, and all the 'bad guys' stick to the chemicals to form 'clumps'.
As I begin to slow down these 'clumps' join together to form 'floc'.
4
I then flow into a large tank where I slow down even more to allow the 'floc' to settle to the bottom. This forms 'sludge'. This 'sludge' will later be sucked out of the tank. I feel much cleaner and lighter, but I'm feeling a bit weak!
5
Ooh this is ticklish! I have flowed over a weir and into another tank where carbon dioxide is bubbled into me. I am feeling much better!
6
Almost clean! As I pass through a sand filter the last stubborn small living organisms and some germs are removed. Hey this doesn't hurt at all!
7
Wow, this feels good! I'm now being mixed with chlorine gas, which kills all the remaining germs. I am sparkling clean. Clean enough to drink!
8
I have now been pumped to a reservoir. What a cool place! So many friends! From here I get piped to houses, schools, businesses and factories. I m really proud to be tap water. Please remember to use me wisely!
Water Wise
For more information about the Water Wise Education Programmes, please contact Rand Water on (011) 682-0732 or www.randwater.co.za
RAND WATER


LWAZI ASKS- WHERE DO WE GET OUR DRINKING WATER FROM?
1
GAUTENG'S WATER IS PIPED FROM THE VAAL DAM TO RAND WATER'S PURIFICATION PLANTS
2
AT THE PLANTS, WATER IS PURIFIED 24 HOURS A DAY!
3
CHEMICALS ARE ADDED TO THE WATER TO GET RID OF THE DIRT
4
IN THE SETTLING TANKS, CHEMICALS AND THE DIRT FORM A LAYER CALLED FLOC, THAT SETTLES TO THE BOTTOM
CLEAN WATER IS DRAWN OFF INTO SAND FILTERS
FLOC
5
SAND TRAPS VERY SMALL BITS OF DIRT AS WATER FILTERS THROUGH IT
SAND
CHLORINE
CHLORINE IS ADDED TO KILL BACTERIA SO THAT THE WATER IS SAFE TO DRINK
6
AFTER THE PURIFICATION PROCESS, THE FINAL WATER GOES TO BIG HOLDING TANKS CALLED RESERVOIRS
7
AT LAST! THE WATER IS PIPED ALL OVER GAUTENG!
8
IN GAUTENG, WE USE 2800 MILLION LITRES OF WATER PER DAY!
2800 MILLION
9
EACH PERSON USES ABOUT 200 LITRES A DAY!
1 LITRE
LUCKILY WE CAN JUST TURN ON THE TAP!
RAND WATER
P.O. Box 1127 Johannesburg 2000
Tel: (011) 682-0911
MARK WIGGETT

ACTIVITY FIVE: JUST FOR FUN: MAKING A BOTTLE RAIN GAUGE

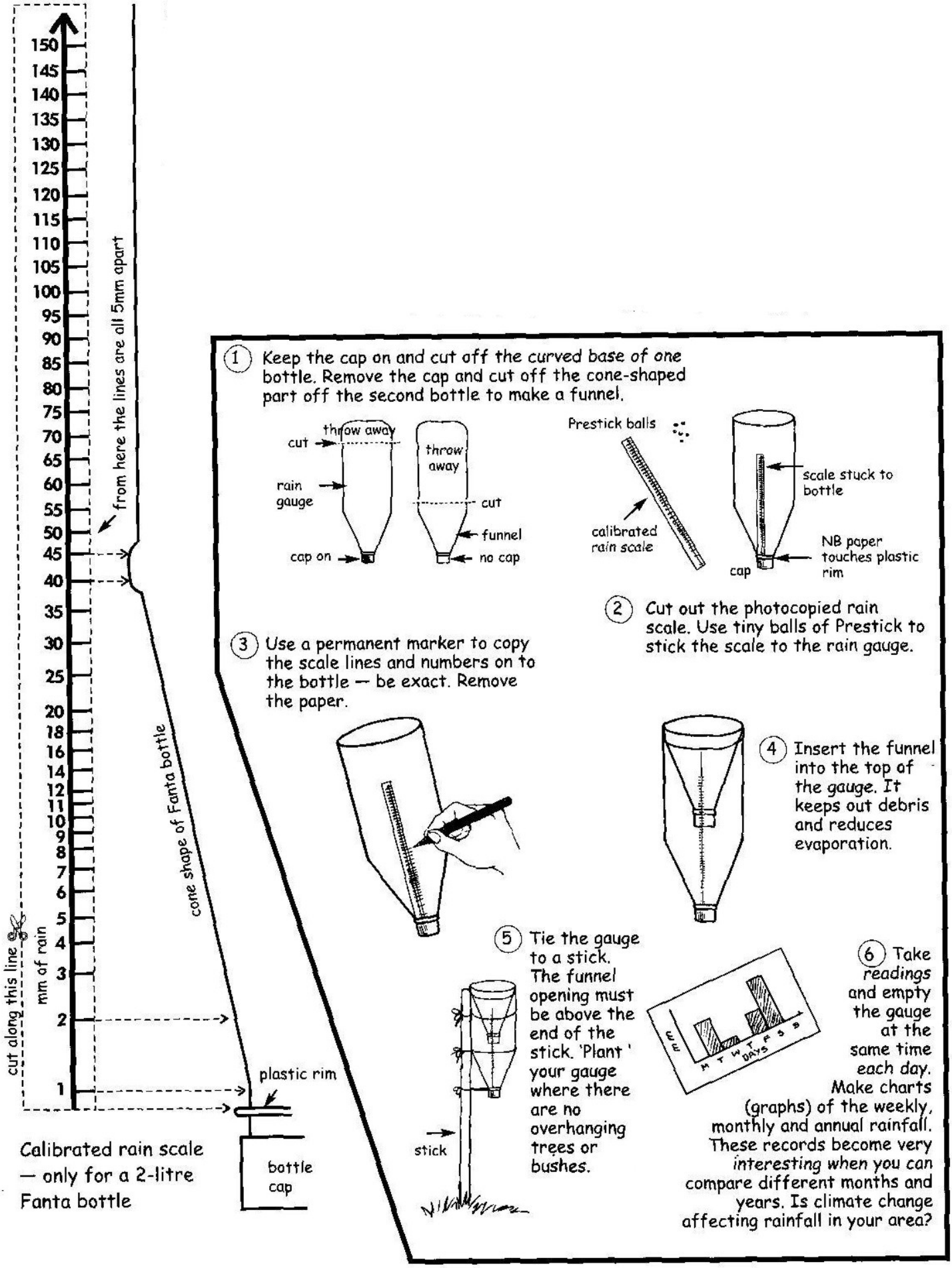
This fun TECHNOLOGY activity can be done in the classroom or at home. For learners who may struggle with this, there are instructions for an easier 'tin can rain gauge' in Activity 2 of the Grade 5 pack.

Measuring rainfall

Rain is measured in millimetres. The narrow base of a cone-shaped rain gauge makes it easier to measure small amounts of rain. The cone has to be specially calibrated (to check, adjust, or determine by comparison with a standard) by doing some magic with maths. To save you the effort, we have given you a rain scale that is calibrated for a 2-litre Fanta cold-drink bottle on the following page *(note: the scale is only accurate on this shaped bottle).*

You will need:

- Two empty 2-litre Fanta bottles
- Craft knife or scissors to cut the bottles
- A photocopy of the rain scale at 100%
- Prestik
- A strong stick
- String
- Fine permanent marker


150
145
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45
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35
30
25
20
18
16
14
12
11
10
9
8
7
6
5
4
3
2
1
from here the lines are all 5mm apart
cone shape of Fanta bottle
cut along this line
mm of rain
plastic rim
bottle cap
Calibrated rain scale — only for a 2-litre Fanta bottle
1 Keep the cap on and cut off the curved base of one bottle. Remove the cap and cut off the cone-shaped part off the second bottle to make a funnel.
throw away
cut
rain gauge
cap on
throw away
cut
funnel
no cap
Prestick balls
calibrated rain scale
scale stuck to bottle
NB paper touches plastic rim
cap
2 Cut out the photocopied rain scale. Use tiny balls of Prestick to stick the scale to the rain gauge.
3 Use a permanent marker to copy the scale lines and numbers on to the bottle — be exact. Remove the paper.
4 Insert the funnel into the top of the gauge. It keeps out debris and reduces evaporation.
5 Tie the gauge to a stick. The funnel opening must be above the end of the stick. 'Plant' your gauge where there are no overhanging trees or bushes.
stick
6 Take readings and empty the gauge at the same time each day. Make charts (graphs) of the weekly, monthly and annual rainfall. These records become very interesting when you can compare different months and years. Is climate change affecting rainfall in your area?

Wetlands are wonderful!

Share-Net

This pack supports an introduction for learners to an Eco-School's focus on environmental information

Grade 7

This pack contains:

Activity One: These **LANGUAGES** activities introduce learners to the importance of wetlands. There is a reading activity, followed by a word search, a comprehension and a fun way of writing poetry.

Activity Two: During this **TECHNOLOGY** exercise, learners investigate, design, make and evaluate a water filtration system, similar to that of a wetland.

Activity Three: Following on from Activity Two, learners test out and evaluate their water filters during this **NATURAL SCIENCES** lesson.

Activity Four: This **SOCIAL SCIENCES: GEOGRAPHY** lesson takes learners on a walk through a wetland and a river, looking for good and bad land management practices.

Activity Five: During this **ARTS AND CULTURE** lesson, learners design and create a "Save our Wetlands" poster. They are encouraged to use mixed media such as paint, pastels, wax crayons, chalk and pastels.

WESSA

This pack of lesson plans is part of a series of lesson plans from Grade R to Grade 10, which focus on water and water-related issues. This resource development project has been funded by the Water Research Commission, Private Bag X03, Gezina, Pretoria, 0031 (Website: www.wrc.org.za).
This pack is available electronically on www.envirolearn.org.za

Activity	Learning Area covered in this activity	Learning Outcomes covered in this activity	Assessment Standards covered in this activity
1. Learners are introduced to the importance of wetlands. There is a reading activity, followed by a word search, a comprehension and a fun way of writing poetry.	Languages	**Learning Outcome 3:** Reading and viewing: The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts.	• Shows understanding of information texts. • Identifies and discusses the social, cultural, environmental and ethical issues contained in texts.
2. Learners investigate, design, make and evaluate a water filtration system, similar to that of a wetland.	Technology	**Learning Outcome 1:** Technological processes and skills: The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.	**Investigates:** • Investigates the background context, the nature of the need, the environmental situation, and the people concerned. **Designs:** • Writes or communicates a short and clear statement or a design brief for the development of a product or system related to a given problem, need or opportunity. • Lists product and design specifications and constraints for a solution to a given problem, need or opportunity based on the some of the design key words. **Makes:** • Develops a plan for making that details all of the following: resources needed; dimensions. • Chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining and finishing different materials with some accuracy.
3. Learners test out and evaluate their water filters.	Natural Sciences	**Learning Outcome 1:** Scientific investigations: The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.	• Conducts investigations and collects data: Organises and uses equipment or sources to gather and record information.
4. Learners take an imaginary walk through a wetland and a river, looking for good and bad land management practices.	Social Sciences: Geography	**Learning Outcome 1:** Geographical enquiry: The learner will be able to use enquiry skills to investigate geographical and environmental concepts and processes.	• Identifies a variety of geographical and environmental sources relevant to an enquiry. • Organises and interprets information relevant to the enquiry from simple map. • Uses information to suggest answers, propose alternatives and possible solutions.
5. Learners design and create a “Save our Wetlands” poster. They are encouraged to use mixed media such as paint, pastels, wax crayons, chalk and pastels.	Arts and Culture	**Learning Outcome 2:** Reflecting: The learner will be able to reflect critically and creatively on artistic and cultural processes, products and styles in past and present contexts.	• Explains the need for conservation of a country’s indigenous knowledge systems, heritage artefacts in museums, galleries, theatres, cultural sites and natural heritage sites.

ACTIVITY ONE: WETLANDS ARE WONDERFUL!

During these LANGUAGES activities, learners find out more about wetlands. A reading activity introduces the importance of wetlands, followed by a word search, a comprehension and a fun way of writing poetry.

Wetlands are often thought of only in terms of their hydrological importance, but they also hold great cultural significance. Many cultures have developed traditional practices and belief systems for regulating the use of wetlands and to protect these valuable ecosystems.

Wetlands are also known as *vleis, bogs, swamps, marshes or sponges*. They are regarded as some of the most productive ecosystems in the world because they serve as sponges that regulate river flow, they provide habitats for a variety of plant and animal species and they help to absorb silt and cleanse water of pollutants.

Wetlands are at risk all around the world due to practices of draining the land for alternative use. Construction of dams, removal of plants, waste water pumped into the area by industries, seepage of agricultural fertilisers and mining are all threats to these sensitive ecosystems.

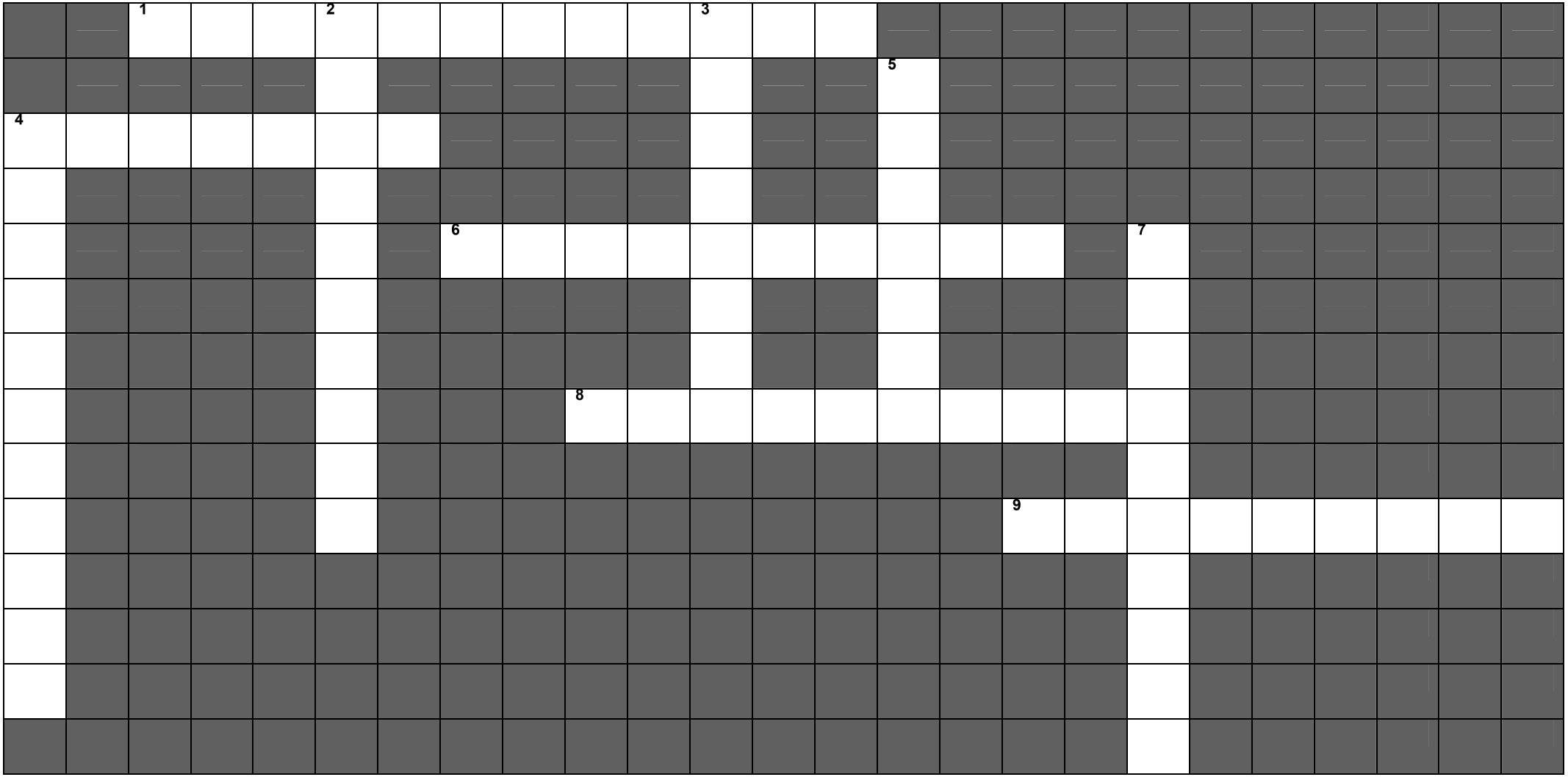
Each year, government departments, non-governmental organisations, schools and groups of individuals undertake actions to raise awareness of the values and benefits of wetlands as well as the important role they play in sustainable freshwater use.

2 February is the anniversary of the signing of the Ramsar Convention in 1971. The Convention took place in the Iranian city of Ramsar and is an inter-governmental treaty to promote national action and international co-operation for the conservation and wise use of wetlands and their resources. There are presently 153 Contracting Parties to the Convention with 1 629 wetlands sites, totalling 145.6 million hectares.

ACTIVITY: UNDERSTANDING THE VOCABULARY:

- All the words in the crossword on the next page can be found in the text above. Use the clues given (across and down) to fill in the spaces.

Name:.....



Across

1. This word describes the laws and properties of water.
4. Matter that has soaked or oozed through a filter.
6. Making or creating.
8. Impurities, dirt and toxins in water.
9. Things that we are able to use.

Down

2. Adjusting, controlling or keeping order.
3. Of different traditional beliefs and practices.
4. Something that is ongoing, that will continue and not be used up.
5. Specific areas in which plants and animals live.
7. Specific habitats and the relationship between all living and non-living parts within it.

COMPREHENSION:
After reading the article on wetlands, answer the following questions in full sentences.

1. Wetlands are important for their storage and filtering of freshwater. In what other ways are they important?

2. What are other names given to wetlands?

3. Name two threats that endanger our wetlands?

4. If wetlands clean pollutants out of the water, why would waste water from industries be a threat to the wetlands?

5. What is a non-governmental organisation?

6. Do you think raising awareness of the problems in wetlands is enough? Give a reason for your answer.

7. For how many years has the Ramsar Convention been in existence?

8. What is a treaty?

9. By looking at the statistics given here, do you think this treaty has been effective?

10. Do you know of any wetlands in your area that require better management? Describe.

ACTIVITY: THERE'S A POET IN ALL OF US!!!

A cinquain is a special kind of poem with 5 lines that's fun, easy and quick to write.

Here is the basic structure of one:

1 word – subject
2 words – descriptive words about the subject
3 words – also descriptive words about the subject
4 words – a phrase
1 word – the subject again

An example would be:

Waterlilies
Delicate, beautiful
Round, green, floating
Found in all wetlands
Waterlilies

Learners can write two or three cinquains on wetlands. If your school produces a yearly magazine, pass the best ones on to the editor!

Criteria to assess learners during this languages lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner filled the correct words into the crossword puzzle				
The learner answered all the questions in the comprehension correctly, with thorough comprehension				
The learner followed the structure of the cinquain				
The learner was able to describe a wetland in their cinquain				

ACTIVITY TWO: DIRTY WATER, CLEAN WATER, LET'S DESIGN AND BUILD A WATER FILTER

During this TECHNOLOGY exercise, learners investigate, design, make and evaluate a water filtration system, similar to that of a wetland.

Wetlands are one of the most threatened habitats in the world. Many have been destroyed because people did not realise their importance. We used them as dumping grounds, for farmland or built houses on them. Now we know better and are working towards conserving our wetlands.

One of the important things that wetlands do is act as filters.

- **Living filters:** Wetland plants absorb nutrients in the water, using them for growth. Plant roots can also trap polluting heavy metals in the soil, especially in clay soil.

- **Spongy soil:** Wetland soils are often made up of clay and contain lots of organic material. Water passes very slowly through these soils before running into streams. This means that the wetlands stay wet for longer, and keep the streams running for longer too.

- **Silt cleaners:** Floodwaters are often muddy, carrying silt from soil erosion. Plants in the wetlands slow down the flow, and the silt settles out. Water running out of a wetland is often much clearer and cleaner than that flowing in. This can be important to people who drink the water downstream.

Aren't wetlands wonderful! They improve water quality as they are such good natural filters and the water leaving the wetland is cleaner than the water entering it!

It's time for the learners to investigate, design, make and evaluate their own water filters.

What the learners need to do:

1. Investigate whether wetlands clean visible pollutants out of water

- Give each learner copies of the enviro fact sheets on wetlands and pollution (at the end of this activity); a copy of the 'A waterworks that works sheet' (they may only use these sheets for ideas and to get them thinking about their own designs, they may not copy these designs).

  The investigation phase is the research phase. Learners need to look at pictures of wetlands, look at books, the enviro fact sheets provided and any other material that they can find on wetlands. They can also discuss their ideas with friends, in small groups and with you, the teacher. Let the learners write a paragraph on their "research" (what sources of information they used, what they found out, what they think they would like to design).

2. Design

- Each learner will need paper and pencils so that they are able to write and draw their design ideas. The design must be on paper and learners should make rough drawings first. When they are happy with their designs, they need to make a neat drawing with a heading and labels or a colour key. The dimensions of the design must be written down and the materials that will be used must be listed. Any constraints / restrictions that the learner can see / anticipate in the future must also be noted.

- It is very important that you, the teacher, guide the learners through this design phase. Some of the learner's designs may be wonderfully creative but very impractical, so you need to be on hand to make sure that their designs will work.

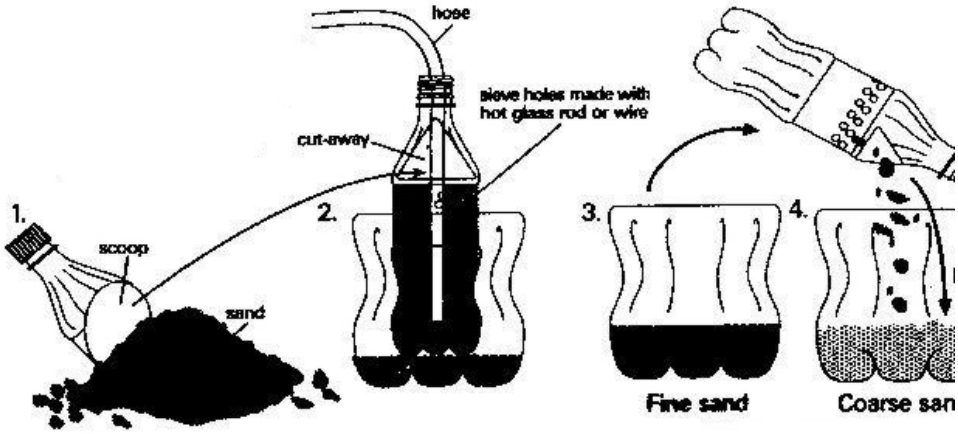
3. Make

- The learners need to gather together the materials they will need to construct their design. Encourage them to use recycled objects if possible. When they have all they need, the designs need to be constructed!

4. Evaluate

- Test the designs during the next activity, a NATURAL SCIENCES lesson!!

Good luck with your water filters!!



Enviro Fact : Pollution

Pollution is an unwelcome concentration of substances that are beyond the environment's capacity to handle. These substances are detrimental to people and other living things. In an undisturbed ecosystem, all substances are processed through an intricate network of biogeochemical cycles, such as the nitrogen and carbon cycles. During these cycles, substances are taken up by plants, move through the food chain to larger and more complex organisms, and when the latter die, are decomposed (broken down) into simpler forms to be used again when they are taken up by plants. Biodegradable substances are those that can be broken down by the environment's biological systems. Pollution occurs when the environment becomes overloaded beyond the capacity of these normal processing systems.

Examples include:

- An excess of normally helpful substances, such as the nutrients nitrogen and phosphorus.
- An excess of substances that are harmless, and perhaps even necessary in tiny amounts, but toxic in concentration. Copper, for example, is necessary in small amounts for healthy plant growth, but becomes a pollutant if it occurs in greater quantities.
- Synthetic (human-made) compounds that are poisonous in the environment, often even in trace amounts, such as DDT, dioxin, PCBs and organochlorines.
- Substances that, in any amount, are not biodegradable, such as plastics and highly persistent chemicals like DDT and other organochlorines.
- Some pollutants kill living organisms outright, other sub-lethal pollutants do not kill, but may cause long-term biological damage, interfere with organisms' reproductive cycle, or make them more vulnerable to disease.

Types of pollution. Pollutants can be grouped according to the main ecosystem which they affect. One pollutant often affects more than one ecosystem.

POLLUTANTS AND MAIN SOURCE	HEALTH AND ENVIRONMENTAL EFFECTS
AIR	
Sulphur dioxide – burning of coal	Acid rain and respiratory problems
Nitrogen oxides – vehicle emissions Volatile hydrocarbons – vehicle emissions	Combine to form photochemical smog; causes respiratory problems
Carbon monoxide – vehicle emissions	Restricts oxygen uptake, causes drowsiness, headaches, death
Carbon dioxide – burning of coal	Global warming
CFCs – aerosol, refrigeration, air-conditioning and foam-blowing industries	Destroy ozone layer
Methane – feedlots, rubbish dumps	Global warming
Noise – industry, traffic	Affects hearing, stressful
Asbestos dust – construction, mining, industry	Asbestosis, mesothelioma
FRESHWATER	
Sewage – inadequate sanitation	Pathogens cause typhoid, cholera, gastroenteritis; nutrients cause eutrophication
Fertilizers – agriculture	Eutrophication
Silt - agriculture, construction, mining	Smothers aquatic organisms; affects light penetration
Pesticides – agriculture, and health services	Toxic; interfere with breeding of mammals and birds
Toxic metals – industry	Health and life threatening
Salinisation – industry, agriculture, landfill	Reduced crop yields; scale and corrosion in domestic and industrial water systems
MARINE	
Sewage – inadequate sanitation	Pathogens cause typhoid, cholera, gastroenteritis; nutrients cause eutrophication
Fertilizers – agriculture	Eutrophication
Oil spills	Smother marine plants and animals
Plastics	Death of marine animals
Pesticides – agriculture, and health services	Toxic; interfere with breeding of mammals and birds
LAND	
Solid waste is classified as hazardous (radioactive, pesticides, medical, poisons), or non-hazardous (domestic, urban, mining, industrial, scrap metal)	Hazardous waste is health- and life-threatening; non-hazardous is unsightly and disposal takes up much space

Dealing with pollution
In the past, most approaches to handling pollution could be summed up by the phrase `dilution is the solution to pollution'. However, pollution levels have increased so much in amount and toxicity that this approach is no longer acceptable. An alternative approach is source reduction, i.e. a reduction in the amount of pollution where produced.

- Point source pollution: pollutants are produced from a stationary location, e.g. industrial plants, mines, and municipal sewage works.
- Non-point source pollution: this pollution cannot be traced to a specific spot, and is far more difficult to monitor and control. Common examples are veldt fires, motor vehicle emissions, fertilizer runoff, sediment from construction and erosion, plastic packaging, and gases from aerosol cans. Some non-point sources can be addressed by laws, such as banning CFCs (chlorofluorocarbons), or requiring car manufactures to install emission controls.

Polluter-must-pay principle
This means that a polluter should bear the costs of avoiding pollution, or remedying its effects. This principle is difficult to apply when the source of pollution cannot be identified, as is often the case with atmospheric pollution. The principle can be usefully applied following a pollution disaster, such as an oil spill from a tanker. However, the consumer often pays for such pollution costs. For example, Eskom estimates that the fitting of scrubbers on the chimneys of their power stations will increase the cost of electricity by 30%.

Movement of pollution
Pollution does not stay in one place but is moved around the world by air and water, as well as by living organisms. Even in Antarctica, birds and marine mammals show traces of pollutants such as DDT and PCBs. Some pollution is deliberately moved abroad. Companies restricted by pollution control regulations at home, sometimes move their plants to other less restrictive countries, as was the case with the plant involved in the Bhopal chemical disaster. Or while remaining at home, they may sell products abroad, that are classed in their own countries as too dangerous for sale, such as banned pesticides. In some cases hazardous waste may also be shipped abroad, generally from industrialised countries to developing countries willing to accept such waste for a fee, despite the hazards. When such pollutants turn up again in the originating country, as when food is imported that contains banned pesticides, the process is said to be completing the `circle of poison'.

What can you do

- *Avoid the creation of waste.*
- *Find out all you can about pollution and protest loudly when you see it happening.*
- *Report air pollution to the Chief Air Pollution Control Officer (CAPCO), Department of Health.*
- *Report freshwater and land pollution to the Department of Water Affairs and Forestry.*
- *Report marine pollution to the Department of Environment Affairs and Tourism, Marine Pollution Division.*

Enviro Fact : Wetlands

Wetlands are difficult to define because of their great variation in size and location. The most important features of wetlands are: waterlogged soils or soils covered with a shallow layer of water (permanently or seasonally), unique types of soil, and distinctive plants adapted to water-saturated soils. Marshes, bogs, swamps, vleis and sponges are examples of wetlands.

Why are wetlands important?
Wetlands associated with streams and rivers slow floodwaters by acting as giant, shallow bowls. Water flowing into these bowls loses speed and spreads out. Wetland plants, particularly reeds and sedges, play an important role in holding back the water. The wetland acts as a sponge as much of the flood water is then stored in the wetland and is slowly released to downstream areas, instead of it all rushing to the sea within a few days. This greatly reduces flood damage, particularly erosion, and ensures a more steady supply of water throughout the year.

Filters: Wetlands improve water quality as they are very good natural filters, trapping sediments, nutrients (e.g. nitrogen and phosphorus), and even pathogenic (disease-causing) bacteria. In addition, pollutants such as heavy metals (e.g. mercury, lead) and pesticides, may be trapped by chemical and biological processes. In other words, the water leaving the wetland is cleaner than the water entering it.

Wetlands and wildlife: Wetlands are filters where sediments and nutrients accumulate, so many plants, such as bulrushes, grasses, reeds, waterlilies, sedges and certain trees grow there. The plants, in turn, provide food and a place for attachment and shelter for many creatures. There is more life, hectare for hectare, in a healthy wetland than in almost any other type of habitat. These productive places support huge numbers of insects, fish, birds and other animals. Some animals are completely dependent on wetlands, whilst others use wetlands only for part of their lives. The wattled crane, for example, is dependant on wetlands for breeding. The rich diversity of waterbirds in southern Africa (totalling 130 species) is possible because of the many wetlands spread across the sub-continent. The wetlands of southern Africa are of international importance as they are the southern destination for many migratory water birds.

People and wetlands: Wetlands have been used for centuries as grazing for domestic stock, and as a source of reeds used for thatching, hut construction and basket weaving. They provide fishing and hunting, and the opportunity to observe wildlife, especially birds. Wetlands are appreciated for their beauty as open spaces and also for their educational value.

Wetlands in trouble: To many people the thought of a marsh, swamp, bog or vlei is associated with dampness, disease, difficulty and danger. Because of this wetlands are often seen as wastelands that should be converted to cropland, dams, commercial timber plantations of alien trees, waste disposal sites and pastures. Many wet- lands have been "reclaimed" for industry and the construction of airports, harbours and sewage treatment plants. Historically wetlands have been drained in attempts to control malaria.

All wetlands in southern Africa are threatened. Botswana's magnificent Okavango Delta is threatened by the possible canalisation of the Boro River to supply South Africa with water for both domestic and industrial use. Throughout the region, smaller seasonal wetlands in urban areas have virtually disappeared, while riverine wetlands are constantly under threat of being turned into agricultural land.

What you can do:

- *Get to know the wetlands in your area and list the plants and animals living there. Draw a map of the wetland's position, size and use. Take photographs of the wetlands from fixed vantage points, and at different seasons of the year, to compare the changes between seasons and from year to year.*

Report the abuse of wetlands to your local nature conservation officer, agricultural extension officer or the Department of Environmental Affairs and Tourism. Always make your report in writing to ensure that the officer concerned has to investigate.

Criteria to assess learners during this technology lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner wrote a paragraph outlining what he/she did during the research phase				
The learner drew rough and neat designs of his/her water filter. He/she had a heading, labels, or a key and had a list of all the materials needed and their measurements				
The learner built his/her design				

A WATERWORKS THAT WORKS

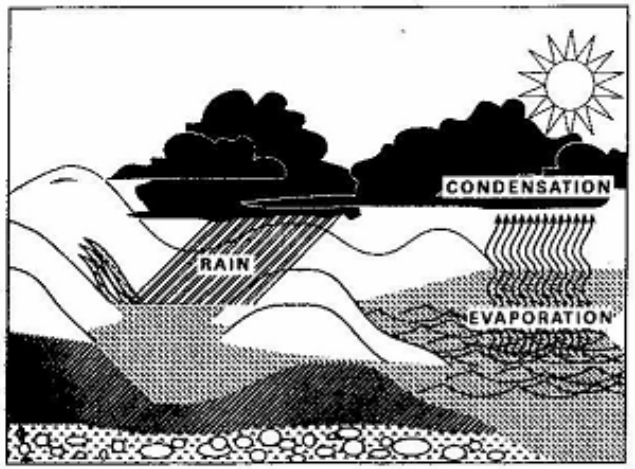
Use this activity sheet to make and use:

A the apparatus to clean and grade sand,

B a working model of a watershed or wetland,

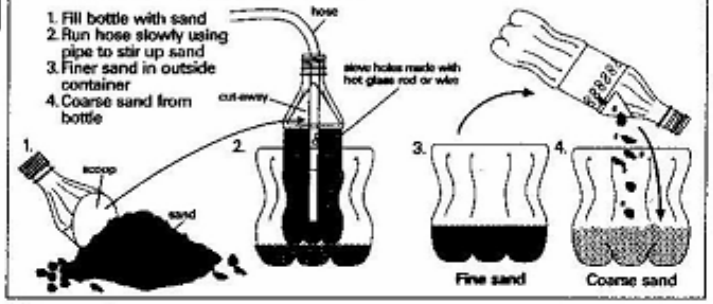
C a sand filter and the other apparatus for a water works that works, and

D an evaporation / condensation chamber to simulate the water cycle.

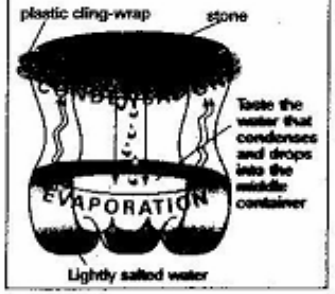


Ⓐ WASH AND GRADE SAND PARTICLES WITH A HOME-MADE SEPARATOR

1. Fill bottle with sand
2. Run hose slowly using pipe to stir up sand
3. Finer sand in outside container
4. Coarse sand from bottle

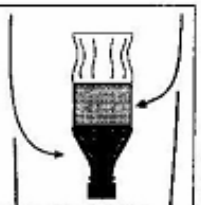


Ⓓ AN EVAPORATION / CONDENSATION CHAMBER TO SIMULATE THE WATER CYCLE.



Ⓒ MAKE A SAND FILTER

1 Add one third fine sand
2 Fill to two thirds with coarse sand
3. Leave about a third for the water that will be held back in the filtration process.



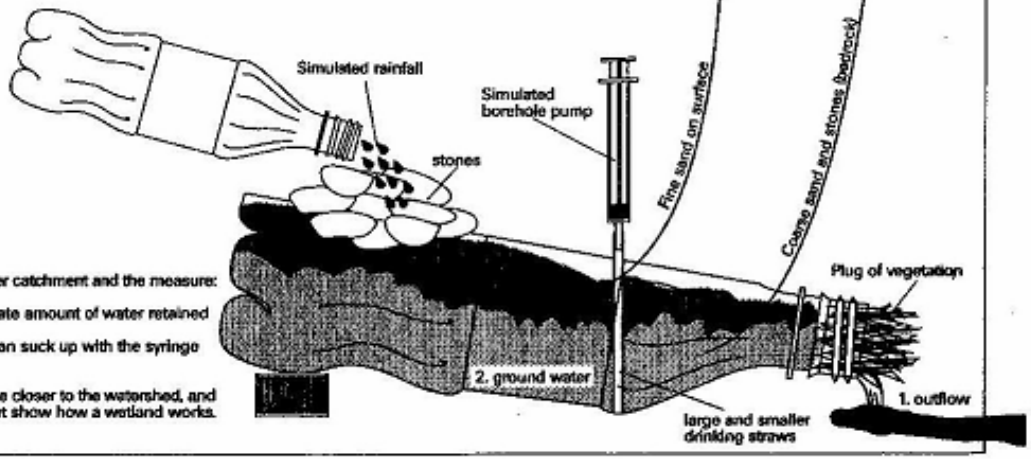
See water works model overleaf

APPARATUS:

Plastic Coke bottles;
a glass rod;
drinking straws;
small syringe,
fishtank plastic tubing;
plastic pipe clamp;
gas lighter or spirit burner;
turbidity disk;
propettes;
Jik;
Alum flocculant.

Optional:
coffee filter paper and fishtank activated carbon to make a carbon filter; Microchem water test kit to test the various stages of the water purifying process.

Ⓑ MAKE A MODEL WATERSHED OR WETLAND

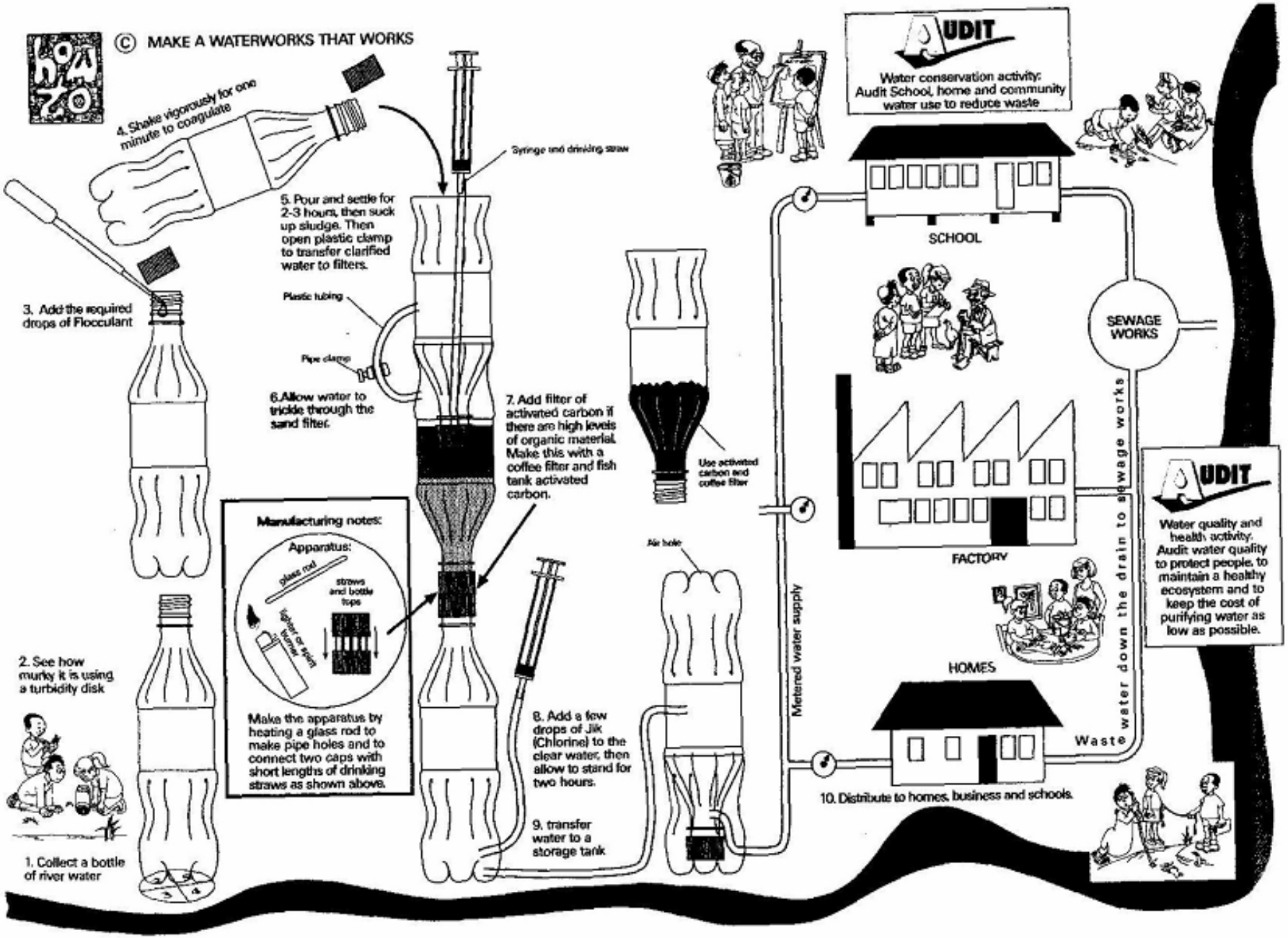


Activity:

Add a bottle of 'rain' to the upper catchment and the measure:

1. Measure outflow and calculate amount of water retained
2. See how much of this you can suck up with the syringe borehole.

Try putting in two boreholes, one closer to the watershed, and work out other experiments that show how a wetland works.


© MAKE A WATERWORKS THAT WORKS
4. Shake vigorously for one minute to coagulate
Syringe and drinking straw
5. Pour and settle for 2-3 hours, then suck up sludge. Then open plastic clamp to transfer clarified water to filters.
Plastic tubing
Pipe clamp
3. Add the required drops of Flocculant
6. Allow water to trickle through the sand filter.
7. Add filter of activated carbon if there are high levels of organic material. Make this with a coffee filter and fish tank activated carbon.
Use activated carbon and coffee filter
Manufacturing notes:
Apparatus:
glass rod
straws and bottle tops
lighter or spirit burner
Make the apparatus by heating a glass rod to make pipe holes and to connect two caps with short lengths of drinking straws as shown above.
Air hole
2. See how murky it is using a turbidity disk
1. Collect a bottle of river water
8. Add a few drops of Jik (Chlorine) to the clear water, then allow to stand for two hours.
9. transfer water to a storage tank
Metered water supply
AUDIT
Water conservation activity: Audit School, home and community water use to reduce waste
SCHOOL
SEWAGE WORKS
FACTORY
HOMES
Waste water down the drain to sewage works
10. Distribute to homes, business and schools.
AUDIT
Water quality and health activity: Audit water quality to protect people, to maintain a healthy ecosystem and to keep the cost of purifying water as low as possible.

ACTIVITY THREE: HOW WELL DO OUR WATER FILTERS WORK?

Following Activity Two, learners test out and evaluate their water filters during this NATURAL SCIENCES lesson.

ACTIVITY

1. Divide the class into groups. Each group must have the equipment listed below.
2. The groups will have as many filters in each group as there are number of learners (in other words if there are five learners in each group, there will be five filters as each learner will have designed and made his/her own filter during Activity Two).
3. Set up the equipment.
4. Each group must test the turbidity of their glass of water before and after filtering.
5. Record the results.

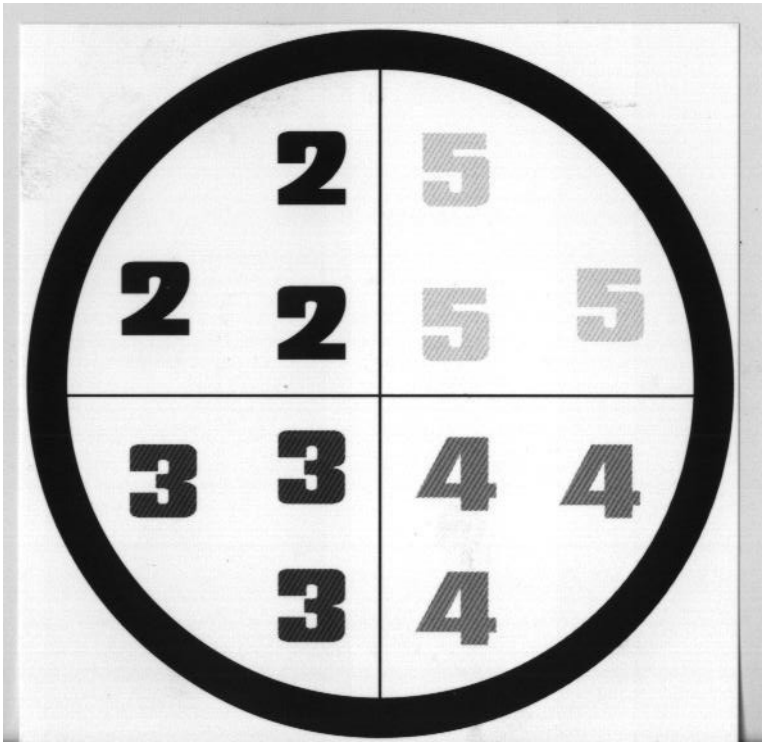
Each group will need the following equipment:

- The water filters constructed during Activity Two, the technology lesson
- Pens and paper
- A glass of dirty water (either collected from a local river or made dirty by adding sand)
- A container to collect the filtered water
- A turbidity disk (to be found on page 12)
- Water clarity (turbidity) information (on page 13)
- Groundwater recharge and discharge (on page 14)
- Enviro fact sheets on “Wetlands”, “Pollution” (use the enviro fact sheets at end of Activity Two) and “Water” (found at end of this activity)

At the end of this activity, groups need to report back on their findings.

Each learner must write up the experiment, the results and their conclusion. *(This could be included into the learner’s portfolio).*

TURBIDITY DISK – to cut out:



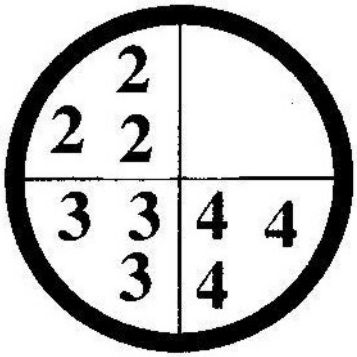
WATER CLARITY (TURBIDITY)

Turbidity refers to the relative clarity of water. Murky water stops light penetration and inhibits water life with a consequent loss of plant and animal diversity. Plants need light to grow and both large and small animals may suffer growth retardation or death because they cannot see to hunt and breed, or their gills may become clogged with particles of silt and organic matter. Suspended solid pollution can be caused by silt from soil erosion, by sewage and industrial waste or by excess microscopic life in the water.

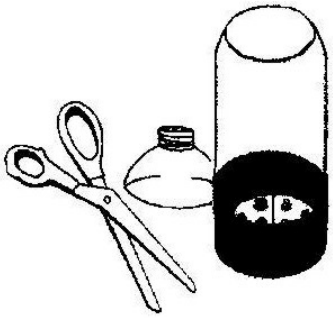
Note: Some rivers are naturally turbid and many organisms can only live in turbid conditions. The key is knowing natural levels in your area especially in Cape and forest 'black water' streams and rivers.

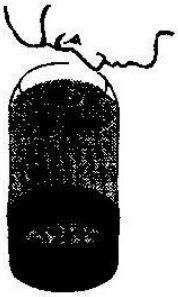
How the test works:

The turbidity sighting disk is based on an early technique of lowering a black washer into a long glass tube of water and noting the depth at which it is no longer visible. The turbidity disk has a circular washer (outer ring scored as 1) and numbers of differing density (scored 2-5). A measure of clear or murky water (turbidity) can be obtained by noting the image density visible in a 20 centimetre column of water.



Testing water clarity / turbidity:



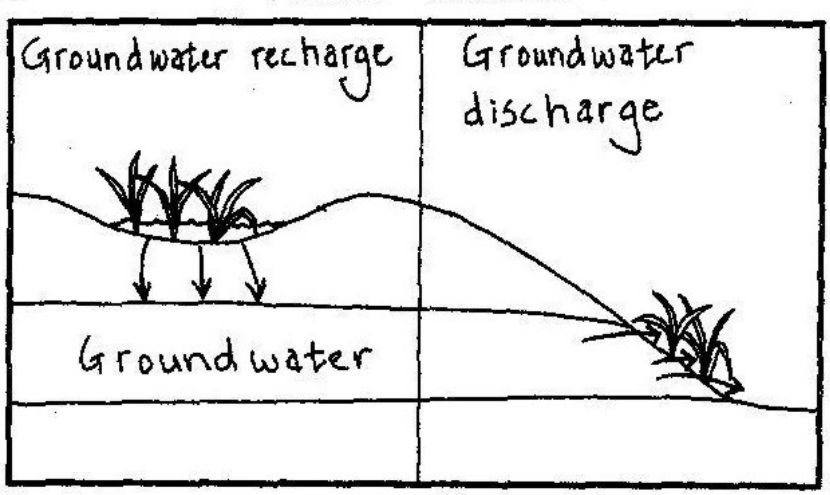


1. Cut down a 1.5 or 2 litre plastic cool drink bottle.
2. Fix the disk to the inside bottom of the bottle.
3. Fill the bottle to 20 cm with a debris-free sample of water.
4. Look into the bottle and pick out the water clarity number that is visible (outer ring [1], 2, 3, 4 or 5).
5. Repeat to get a reliable result.

The water clarity is:	Disk not visible	Score 1-3	All visible
	BAD	**NOT SO GOOD**	**OK**

Information Sheet on Groundwater recharge and discharge

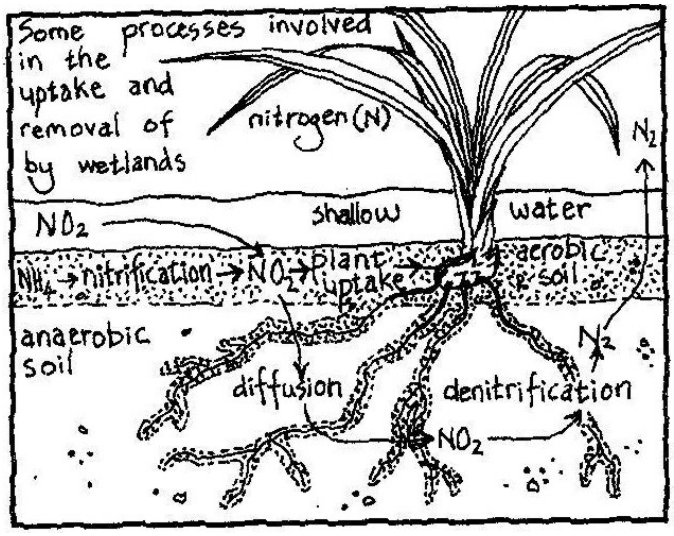
Wetlands may have an important influence on the recharge or discharge of groundwater. Groundwater recharge refers to the movement of surface water down through the soil into the zone in which permeable rocks and overlying soil are saturated. Groundwater discharge, in contrast, refers to the movement of groundwater out onto the soil surface. Although poorly understood, it appears that most wetlands are groundwater discharge or throughflow areas. Wetland areas where groundwater is discharging are often referred to as seepage wetlands because they are places where the water seeps slowly out onto the soil surface.



Water purification

Wetlands are natural filters, helping to purify water by trapping pollutants (such as sediments, excess nutrients [most importantly nitrogen and phosphorus] heavy metals, disease-causing bacteria and viruses and synthesized organic pollutants such as pesticides). Thus, the water leaving a wetland is often purer than the water which enters the wetland. Wetlands are able to purify water effectively because:

- they slow down the flow of water causing sediment carried in the water to be deposited in the wetland. This also results in the trapping of other pollutants (e.g. phosphorus) which are attached to soil particles;
- surface water is spread out over a wide area, making it easier for exchanges between soil and water;
- there are many different chemical processes taking place in wetlands that remove pollutants from the water. For example, wetlands provide a suitable place for denitrification because anaerobic and aerobic soil zones are found close together. Denitrification is important because it converts nitrates, which could potentially pollute the water, to atmospheric nitrogen which is not a pollution hazard;
- some pollutants such as nitrates are taken up by the rapidly growing wetland plants;
- the abundant organic matter in wetland soils provides suitable surfaces for trapping certain pollutants such as heavy metals; and
- wetland micro-organisms help decompose human organic pollutants such as pesticides.



Enviro Fact : Water

Water. South Africa is extraordinarily rich in natural resources - except for water. Water is a vital but scarce resource, distributed unevenly in time (frequent droughts alternate with periods of good rainfall) and space (the eastern half of the country is markedly wetter than the western half). Increasing demand for water, and decreasing water quality, make careful water management a priority in our country. It has been estimated that by the year 2025 South Africa's human population will have doubled, and that there will be insufficient water for domestic use, agriculture, and industry.

Rainfall. Our average rainfall is less than 500 mm a year, with the driest part of the country receiving less than 200 mm/year and the wettest receiving more than 2 500 mm/year! Rain does not always fall where it is most needed, and some areas of high demand, such as Gauteng, receive less water than they need. Most rain falls in the narrow belt along the eastern and southern coasts. The rest of the country receives only 27% of South Africa's total rainfall. In addition, hot, dry conditions result in a high evaporation rate.

Water is thus a very scarce resource in South Africa. Large-scale engineering has been used to store water behind dam walls, and to distribute water from regions of plenty to regions of need.

Rivers. There are few natural lakes in South Africa. We depend on rivers, dams and underground water for our water supply. Approximately 75% of the water flowing from South Africa into the sea occurs along the eastern and southern seaboards, where many short rivers occur. Flowing from east to west is the largest river in the country, the Orange River, which drains most of the rest of the country. Its water comes from sources in the Drakensberg and Maluti Mountains, and it flows into the Atlantic Ocean on the west coast.

Dams. About half of South Africa's annual rainfall is stored in dams. We have about 550 government dams in South Africa, with a total capacity of more than 37 000 million m^3. Dams have both positive and negative impacts. They can be beneficial for people in that they regulate the flow of a river, reducing flood damage and contributing to perennial rather than seasonal flow. In addition, sediment is deposited in a dam, and the growth of aquatic plants means that nutrients are removed from the water. Thus water leaving a dam may be cleaner than water entering it. The riverine ecosystem is usually affected negatively by a dam. Alterations in flow regime (quantity of water and timing of periods of high and low flow), temperature and water quality may cause reductions in biodiversity of riverine organisms below dams. Reduction in water flow reduces the river's scouring ability and this can lead to silting of estuaries.

South Africa's landscape is not well suited to dams. There are few deep valleys and gorges, with the result that most dams are shallow with a large surface area. Together with the hot, dry, climate, this results in much water evaporating from dams. In addition, the high silt load (a result of an arid climate, steep river gradients and poor farming methods) of our rivers means that the capacity of South Africa's dams is quickly reduced as they become silted. The rivers of the western Cape carry relatively less silt than those in the rest of the country.

Water abstraction. A growing problem for South Africa's rivers is a lack of water! Reduction in river flow, owing to abstraction (removal), and damming, has affected many of our rivers, for example those flowing through the Kruger National Park.

Intercatchment transfer of water. This involves the transfer of water from catchments with good supplies and low demand, to those where demand for water is high and the supply is poor. There are numerous intercatchment transfer schemes already in operation, and more are under construction or proposed. A major scheme is the Orange-Fish River scheme, where water gravitates from the Orange River at the Gariep Dam, and is piped through tunnels and canals to the Sundays and then the Fish Rivers in the Eastern Cape.

Transfers of this nature will have far-reaching ecological, political and socio-economic implications. As yet, little research has been carried out to establish the ecological consequences of intercatchment water transfers. However, areas of concern include reducing streamflow and water levels in one system, changes in water temperature and chemistry, and the transfer of invasive species between catchments.

Water pollution. Industrial and agricultural pollutants common in South Africa include: agricultural fertilizers, silt, toxic metals, litter, hot water and pesticides. These pollutants affect aquatic ecosystems and human health. Disease-producing bacteria are common in urban waste water, particularly from informal settlements that lack sewage and water purification facilities. For example, typhoid, cholera and gastroenteritis are transmitted by water contaminated with untreated sewage. Gastroenteritis is one of three main causes of death in South African children under the age of five.

Criteria to assess learners during this natural sciences lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner was able to test the filters in his/her group				
The learner was able to record the results of the filter tests (i.e. what happened)				
The learner was able to write up the experiment, the results and make a conclusion				

ACTIVITY FOUR: WALKING IN A WETLAND WITH DAVID

This SOCIAL SCIENCES: GEOGRAPHY lesson takes learners on walk through a wetland and a river, looking for good and bad land management practices.

Historically, wetlands have been regarded as unproductive and even unhealthy wastelands. Although an understanding of the value of wetlands and wetland conservation has grown in recent years, some people continue to convert natural wetlands to intensive agricultural land or fill them with soil and rubble to provide space for industrial, urban and tourist expansion.

Each group will need the following equipment:

- A copy of 'David's Wetland Walkabout' (see end of this pack)
- 2 different coloured highlighter pens per group
- Articles on flood reduction and streamflow regulation (see end of this activity)
- Enviro fact sheet on Wetlands (at the end of Activity Two)

WHAT TO DO?

1. Divide the class into groups of 5 or 6 learners.
2. Give each group the equipment listed above.
3. The groups are to follow these instructions:

   Using the highlighter pens, mark the following:

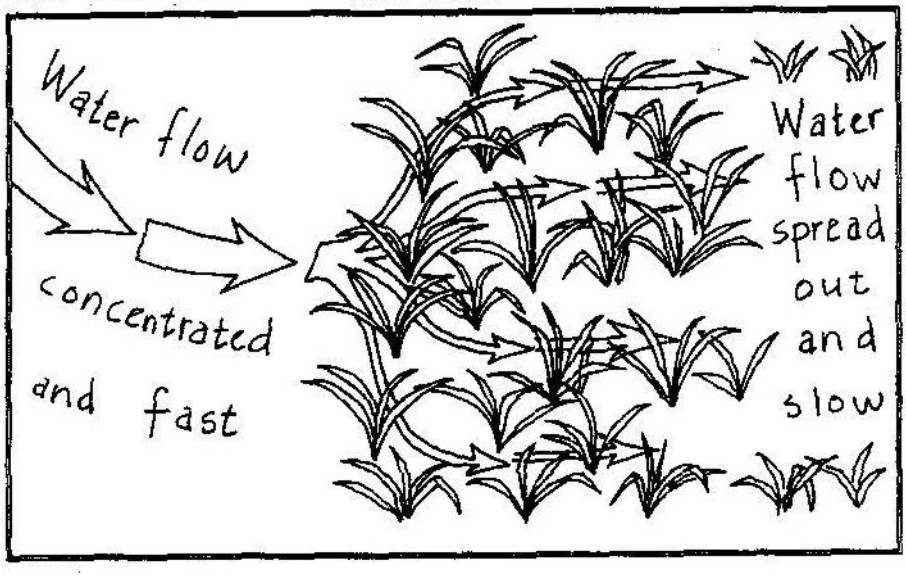
   - Areas where good management of the land around the river will help prevent flooding *(teacher, there is a wetland checklist for you to use if necessary at the end of this activity)*.
   - Areas where bad land management could lead to flooding *(teacher there is a wetland checklist for you to use if necessary at the end of this activity)*.
   - Using the information gathered, each learner is to write a letter to the Mayor of Bokkiesburg, warning him/her of the potential flooding hazard in the town. Include some suggestions for good land management. *This letter could be included in the learner's portfolio.*

Flood reduction and streamflow regulation

Wetlands spread out and slow down water moving through the catchment because:

1. The characteristically gentle slopes of the wetlands and,
2. The resistance offered by the dense wetland vegetation.

Also many wetlands do not have well-defined channels that would otherwise speed up the movement of water.



By slowing down the movement of water and detaining it for a while, wetlands act as sponges which reduce floods and also prolong streamflow during low flow periods. Loss of water to the atmosphere through evaporation and transpiration does, however, reduce the amount of water available to prolong low flows. When wetland vegetation is growing, water is lost from the leaves through transpiration. However, the water lost into the atmosphere from a vegetated wetland is usually less than would be lost from the surface of an open water area such as a dam. This is because the cover provided by wetland vegetation reduces evaporation from saturated or flooded soil by sheltering it against the sun and wind. When the vegetation dies back, there is no loss of water through transpiration and the dead leaves remain, continuing to shelter the soil. During such times, water loss is most effectively regulated.

WETLAND CHECKLIST

Harmful actions / Poor land management	Good actions / Good land management
Toilets, rubbish, cattle and erosion polluting a water supply.	A water source protected by a fence, and water being piped to a storage dam for community use.
Alien trees planted in a mountain valley catchment.	A permaculture farm (growing several crops) which has natural vegetation between the fields and the river
Farmer draining and ploughing a wetland.	A restored catchment (start of a river) where rocks and plants prevent soil erosion, and people can picnic and enjoy nature.
Four places where housing and farming practices have removed natural plants from the river's edge and caused erosion.	
Farmer John who uses too much fertiliser. Water run-off from his land causes algal bloom in the dam.	
Farmer Brown spraying pesticide too close to the river. This kills water animals.	
A dry river bed because of a dam. All the river animals and plants have died.	
A wetland being filled with rubble for housing development.	
Bokkiesburg factories, and litter polluting the river.	
A narrow bridge causing erosion of the river banks.	
A mangrove swamp that has been drained, and houses built too close to the river mouth.	

Criteria to assess learners during this social sciences: geography lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner was able to identify good land management practices from 'David's Wetland Walkabout'				
The learner was able to identify bad land management practices from 'David's Wetland Walkabout'				
The learner wrote a letter, warning of the flood potential to the town and was able to offer suggestions of good/better land management practices				

ACTIVITY FIVE: "SAVE OUR WETLANDS" POSTER

During this ARTS AND CULTURE lesson, learners design and create a "Save our Wetlands" poster. They are encouraged to use mixed media such as paint, pastels, wax crayons, chalk and pastels.

You will need:

- Paper – white or coloured
- Paint
- Pastels
- Kokis
- Chalk
- Wax crayons

What the learners need to do:

1. In groups of 4 or 5 learners, discuss why we need to conserve our natural areas, like wetlands.

2. What are ways that an awareness can be raised? *(examples could be through radio, television, posters, newspaper articles, demonstrations, debates)*

3. Individually, and using a mixture of media (paint, pastels, kokis, chalk, wax crayons), create a bright and colourful "SAVE OUR WETLANDS" poster.

   Learners may want to add very brief notes on their poster as to the threats of wetlands, why they are so special but they must remember not to add too much text.

4. Put the posters up around the school to create awareness of the threat to wetlands.

Criteria to assess learners during this arts and culture lesson

Criteria	Exceeded requirements of the Learning Outcome	Satisfied requirements of the Learning Outcome	Partially satisfied requirements of the Learning Outcome	Not satisfied requirements of the Learning Outcome
The learner was able to explain, within his/her group, why there is a need for the conservation of wetlands				
The learner used a variety of media to draw an informative, bright and colourful poster				

DAVID'S WETLAND WALKABOUT

by Roberta Griffiths & artwork by Sue Spies