Supported by Sida

YOUTH AND UNITED NATIONS GLOBAL ALLIANCE LEARNING AND ACTION SERIES

Water Challenge Badge

Resource and Activity Guide

CBD :: FAO :: UN-WATER :: WAGGGS :: WOSM

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned. The views expressed in this information product are those of the author(s) and do not necessarily reflect the views of FAO.

All rights reserved. Reproduction and dissemination of material in this information product for educational and other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders.

Applications for such permission should be addressed to:
Chief
Electronic Publishing Policy and Support Branch
Communications Division
FAO
Viale delle Terme di Caracalla, 00153 Rome, Italy
or by e-mail to: copyright@fao.org

©FAO 2013

This document has been financed by the Swedish International Development Cooperation Agency, Sida. Sida does not necessarily share the views expressed in this material. Responsibility of its contents rests entirely with the author.

Table of Contents

Join us to make a difference! 5

Introduction 6

- How the resources are organized 7
- Age ranges of activities 8
- How to use this document 8
- Be safe and sound 10

Water is Life 11

- Introduction 12
- Activities 13
- Useful resources 45

Using Water 46

- Introduction 47
- Activities 48
- Useful resources 72

Water at Risk 73

- Introduction 74
- Activities 75
- Useful resources 113

Water for a Better World 114

- Introduction 115
- Activities 116
- Useful resources 146

Take Action 147

- Introduction 148
- Activities 149

Useful resources 168

Glossary 169

Resources and additional information 174

Join us! 174
Share with us! 174
Take the challenge! 174
Organizing events and activities 175
Find out! 175
Think! 175
Raise your voice! 175
Sponsor and partners 176

Join us to make a difference!

The Youth and United Nations Global Alliance (YUNGA) is a partnership between United Nations agencies, government institutions and civil society organizations that have joined forces to encourage children and youth around the world to become aware of the issues that affect all human beings everywhere. YUNGA was conceived as a gateway to assist the engagement of young people in activities of key environmental and social concern and to promote their participation in the initiatives of the United Nations.

Children and youth have the right and the responsibility to be informed and take action. By providing practical tools, YUNGA and its partners educate young people and motivate them to become actively involved in the protection and sustainable use of our **natural resources** and the life it sustains. Children and youth are responsible citizens capable of taking up the challenge and acting as effective agents of change.

Agriculture, **biodiversity**, **climate change**, energy, forests, hunger, nutrition, water and Millennium Development Goals (MDGs) are only some of the thematic areas on which YUNGA and its partners are working. Their strong commitment to making an impact on youth's lives has guided them in the development of fascinating resources which have a global coverage, but with a local outreach. YUNGA is already making a difference, and everyone is invited to join in!

Children and youth have the strength and the ideals to make the world a better place for themselves and for the generations to come. As their leaders and teachers, you can empower them through sharing knowledge and encouraging their participation. If you believe, as we do, that young people have an important role to play in addressing and overcoming these and other issues, the ***Water Challenge Badge – Resource and Activity Guide*** *is a great way to start shaping the future leaders of our world!*

YOUTH & UNITED NATIONS GLOBAL ALLIANCE
YUNGA

Introduction

The *Water Challenge Badge – Resource and Activity Guide* is designed to support you in educating children and youth about water, the challenges our water resources are facing and the importance of using water fairly and sustainably. The guide contains simple teaching tools to make learning appealing and fun, and provides a selection of activities and exercises to encourage young people to engage in efforts to save water and to promote equitable access to clean water. The guide can be used to achieve the Water Challenge Badge or can be used separately.

The materials we propose seek to ensure that young people consider the environmental, economic and social impacts of their actions and decisions in the local and global community. By using the guide you will help them understand that all members of society have the right to live in and enjoy a healthy and safe world where they can ensure their well-being and happiness. Although these activities teach specific skills and knowledge, their broader intent is to stimulate thought and discussion about the issues that affect our world today, and its consequences for the future.

Other materials

This guide complements the Water Challenge Badge activity booklet, which has been designed to help educate children and youth about the crucial role water plays for life on our planet. You can find this and other resources at www.yunga.org

To receive updates on new releases and other YUNGA news register for the free YUNGA newsletter by emailing yunga@fao.org

Help your group take up the challenge, use these materials to motivate them to learn and act, they have a lot to say about the issues that are affecting everyone on Earth and possess unique insights into solving problems in their communities. Children and youth have a loud voice, so encourage them to raise it and tell the world they are here to stay and make a difference!

How the resources are organized

The activities and exercises have been organized in the same order as in the Water Challenge Badge. These are divided into five main sections:

A. **Water is Life:** this section introduces basic facts about water and its importance to life on earth.
B. **Using Water:** this section looks at how much water we use in our daily lives -from **sanitation** and health to the production of the food and goods we use every day.
C. **Water at Risk:** this section discusses the many ways in which unsafe or insufficient water supplies negatively impact life on earth.
D. **Water for a Better World:** this section explores the connection between water and development, considering **human rights**, health and conflict.
E. **Take Action:** this section suggests ideas to motivate and help your group or class undertake water-related initiatives within your local communities.

Each activity of this guide contains:

Aim	A statement of the knowledge the activity wishes to transfer.
Materials	A list of the materials needed for the activity.
Time	The amount of time needed to carry out the activity.
Background	Some activities contain useful information that provides an overview to the focus of the activity.
How to do it	A clear explanation of the steps needed to develop the activity.
Discussion	Useful questions for you to use when discussing about the issues that are being considered.

More resources

Useful **websites** are provided at the end of each section to help you obtain useful information for you and your group and, of course, to get you moving! A **glossary** explaining key terms can also be found at the end of the activities sections.

Age ranges of activities

To help you and your group select the most appropriate activity, a coding system is provided to indicate the age group that the activity is most suitable for. Next to each activity you will see a code, for example **'Level 1 and 2'**, which indicates the activity should be suitable for five to ten years old and eleven to fifteen years old.

Please note that this coding is only indicative. You may well find that some activities at other levels are more suitable for your group or particular individual.

Level 1 FIVE TO TEN years old
Level 2 ELEVEN TO FIFTEEN years old
Level 3 SIXTEEN PLUS years old

How to use this document

Step 1

Activities are provided for each category: **"Water is Life"**, **"Using Water"**, **"Water at Risk"**, **"Water for a Better World"** and **"Take Action"**. Use the activities you think will work best with your group, according to your possibilities, needs and interests. The activities listed are just ideas, so we encourage you to be creative and modify them or come up with new ideas. Most of all, think of ways to make the activities lively and fun, for example through songs, games, plays, concerts, painting, photography, posters, collages, poems, quizzes, essays, fairs, conferences, workshops and many more. Some activities can be done individually, and others in small groups.

You can contact others to join the discussions. Invite families and the community to contribute to and participate in your activities. You can also invite media representatives to help you publicize your event and promote public awareness.

Step 2

Support and guide your group while they carry out each activity. Allow enough time for the children and young people to prepare adequately. Encourage them to think and act creatively when undertaking their activities.

Step 3

Encourage a discussion. Providing an opportunity for questioning is a good way to promote a deeper understanding about a topic and develop thinking skills (see the **'How to make good questions'** box on the next page). Moreover, this will lead them to reflect of ways in which they can take action in their

lives and their communities. Let your group discuss different points of view and come up with possible solutions. You can finish by reaching some general conclusions.

Step 4

At the end of the activity allow enough time for a feedback; see what individuals thought of the activity and what they have learned. Will this motivate them to make changes in their daily lives? See if they are interested in doing another activity, maybe they want to carry out an initiative in their school or local community. You can introduce them to the **Water Challenge Badge**; see if they are interested in facing the challenge and getting the badge.

Step 5

Share with YUNGA! We are always delighted to hear how you have been using our resources, so send us your stories, photos, drawings, ideas and suggestions to: **yunga@fao.org**

How to make good questions

Avoid questions that can be answered by 'yes' or 'no'. Let the participants know that you want them to reflect about a specific topic. Remind them every idea is important. Encourage them to ask questions.

Remember you don't have all the answers. Let the participants discuss possible answers and come up with creative solutions. Answer a question with another question. This helps the participants to think further and draw conclusions.

Sample questions:

* What would happen if...?
* What did you notice about...?
* What are some possible explanations of...?
* What is the role of...?
* How do you think you/them would feel about...?
* If you were ... what would you do?
* What would you have done differently?
* What are the advantages and disadvantages of...?
* What can this teach us about...?
* Can you describe several things we can do to...?
* Would everyone agree with...? Why or why not?
* Can you name some good examples of...?
* What changes can you make to...?

Be safe and sound

The Resource and Activity booklet has been designed to support you in undertaking educational activities. However, as you will be implementing these activities in different contexts and **environments**, it is up to you to ensure that the activities you choose are appropriate and safe.

Exploring the great outdoors is a fantastic way to learn about the natural world; nevertheless, it is important to take some precautions to ensure nobody gets hurt. Please plan carefully and make sure you have enough adult support to keep participants safe, especially when near water. Some general precautions to consider include:

Look after yourself

* Wash your hands after every activity.
* Don't look directly at the sun.
* Don't taste things you find unless you are certain they are not poisonous.
* Don't drink water from natural sources unless you are sure it is safe.
* Be particularly careful when you're near water (especially non-swimmers). Make sure there is a lifebelt to hand if you are near deeper waters.
* Be careful when using sharp objects and electrical appliances. Young children should be supervised by an adult at all times.
* In some activities, you have the option of uploading pictures or videos to the internet on websites such as YouTube. Always make sure that everyone in the pictures or video, and/or their parents, have given their permission before you post anything online.

Look after the natural world

* Treat nature with respect.
* It is better to leave nature as you found it. Never pick protected species. Before collecting plants or picking flowers, get permission. Only take what you really need and make sure you leave at least one third of anything you find in the wild.
* Be careful if you are working with animals. Wear protection if necessary. Be gentle. Make sure they have appropriate food, water, shelter and air. When you're done, return them to where you found them.
* Recycle or reuse the materials used in the activities as much as possible.

Water is Life

Introduction

Have you noticed our planet is blue? Well, that's because 70 percent of it is covered by water! However, out of the Earth's total supply of water, 97.5 percent is saltwater and only 2.5 percent is **freshwater**. Furthermore, almost 70 percent of this **freshwater** is locked up in glaciers and ice-caps; this means that less than 1 percent of the world's water is available for humans, animals, plants, and all other forms of life.

Water truly is life. No living being on Earth can survive without it. Water is essential for human health and well-being as it allows us to meet basic human needs such as drinking water and **sanitation** services. Water is also necessary to grow food and to manufacture all kinds of products. But, beyond human uses, water is also critical for the preservation of the **environment** and its living creatures. Water nurtures our landscapes and provides **habitat** for wildlife. Currently, scientists have come to appreciate to a higher extent the valuable services provided by water-related **ecosystems**, from **flood** control to storm protection and water purification. As you can see, water is a crucial part of our life.

The water available in planet Earth is the same water that has always been available and the only water that will ever be available. This means that we have a limited amount of usable **freshwater**. But, if all living beings use water every day, why doesn't our planet run out of water? This is because water is a **renewable resource**. Our water is never sitting still, it is recycled and reused over and over again as it is constantly moving on, above and below the surface of the Earth through a process called the **water cycle**. Unfortunately, due to human activities, our water is facing different challenges that are affecting the quality and the availability of water around the world. It is essential to understand that water is a vital resource that needs to be used wisely!

Our world is changing and it needs your help! It is time for you, the children and youth from all over the world, to use your amazing energy and creativity to assume different challenges to protect water and ensure every living being clean supplies for the future. Many young hands are already working hard to conserve our world's water resources and to promote water access for all, but there is still a long way to go, they need you! Remember, if you start working today, you can make a difference tomorrow!

Some of the activities below require participants to go near water bodies. Be sure to take water safety precautions and to develop the activity under qualified supervision!

Activities

Water Fun

Level 1 2

Aim

To have fun with water and to realize how water is essential for us.

Materials

An outdoor setting; different materials might be needed according to the planned activities, these might include: pot, dirt, flower, watering can, water; small container; fruit to share, drinking cups; watercolour paints, paper, brushes; water balloons; soap and towels.

Time

30 minutes.

Background

What do plants, animals and humans have in common? They all need water to live! Plants and trees soak up water from the soil through their roots. Elephants drink water from ponds and they also use water to stay cool. And, people drink and use water to take a shower and to wash their teeth. Water is an essential part of all living beings.

How to do it

1. Remind your group how water is so important for us and explain to them that you are going to have some fun with water, doing different things that involve water.
2. Take your group to an outdoor setting an try some of these ideas:
   - Plant a flower and water it.
   - Put some water in a small container for birds to drink it and to clean their feathers.
   - Wash some fruit with water and share it with the entire group.
   - If you have a pet, play with him and once you finish give him some water.
   - Play a game, maybe play tag or jump the rope, and then share a glass of water.
   - Make a drawing using watercolour paints, maybe a lake or a fish aquarium.
   - Play catch using water balloons.
   - And, of course, don't forget to wash your hands every time you finish an activity!

Make sure you dry up or change your clothes if you get wet!

Discussion

What do you enjoy the most about water?
Why do we say that water is life?
Whose responsibility is it to take care of water?

Water Around the World

Level 1 2 3

Aim

To reflect about the amount of fresh water found on Earth.

Materials

Water, a spoon, two measuring cups, a world globe.

Time

30 minutes.

How to do it

1. Start by asking your group to use the world globe to identify all the sources of water they can find: oceans, rivers, lakes, ice caps, ponds... Explain that these are called **surface waters**.
2. Ask the participants if they think there is more water or land on the globe. Is there water beneath the surface of the ground that we cannot see on the globe?
3. Ask your group if they know which kinds of water bodies are salt water and which are **freshwater**. Have they ever tasted salt water? Was it good?
4. Remind them that 97.5 percent of water is in the ocean, so we can't use it because it is salty, this leaves only 2.5 percent of drinkable **freshwater**, but almost 70 percent of this water is frozen as ice-caps and glaciers, so less than 1 percent is **freshwater** we can use.
5. Explain to your group that you will try to show them how water is divided in our world. Pour 2 200ml of water in a glass, this will represent the total of water on Earth.
6. Take 12 spoons of water out of this 2 200ml, the remaining water will represent the salty water in the oceans and seas.
7. Now, the 12 spoons of water will be divided as follows: nine spoons represent the ice caps and glaciers, two spoons represent the **groundwater**, a half spoon represents the **freshwater** from lakes and one drop of water represents the water from rivers.

Discussion

Why is Earth called the 'water planet'?
Now that you know how much **freshwater** our world has, do you think you need to change your water habits? Why?
Do you think life without water is possible? Why?
Can you name some benefits of water?

Source: United Nations Environment Programme, Tunza, Children, A Trip With Drip, http://unep.org/tunza/children/images/flash/a_trip_with_drip/start.swf

Watery Memories

Level 1 2 3

Aim

To realize that water plays an important role in recreation and fun.

Materials

Notebooks, pencils, colouring pencils (optional).

Time

One hour.

Background

Water is the world's most precious resource as it is probably the only one to touch all aspects of human life, from **sanitation** and **hygiene**, to agricultural and industrial development, to the recreational, cultural and religious values embedded in society. The need and demand for water have been a driving force for the well-being and development of societies throughout human history.

Cultural differences play a key role in the way water is perceived, valued and used, and water is also an integral part of recreational expression within a society. Water related activities are an excellent way to maintain a balance between the physical, spiritual and emotional sides of any human being. Millions of people worldwide see water as a source of health, relaxation and happiness.

How to do it

1. Remind your group how water intervenes in most, if not all, of our everyday activities. Have them discuss about the topic for some minutes.
2. Prompt the participants to reflect on a memorable experience involving water, such as watering a tree they just planted, a river-rafting trip or even a visit to the Niagara Falls in Canada.
3. Next, ask the participants to write a small essay regarding their experience and their feelings about water, how important was the role of water in that particular activity? The younger participants can also make a drawing about their experience.
4. Have each participant share their text with the rest of the group.

Discussion

Can you think of any activity where water in not involved, directly or indirectly?
What would happen if water was no longer available to enjoy the activities you just mentioned?
How important is water in your cultural and recreational activities?

Adapted from: Water Partners International, Global Water Supply, Elementary School Curriculum, http://static.water.org/pdfs/WPElemCurricFULL.pdf

How Much Water Is In Your Body?

Level 1 2

Aim

To realize the human body is mainly formed by water.

Materials

Notebook, pencils, bathroom scale, calculator (optional).

Time

20 minutes.

How to do it

1. Remind your group that water makes up about 70 percent of a human's weight and that a person could not live without water.
2. Explain to them that you are going to calculate how much water is in their bodies.
3. Have each participant (or you could just choose two or three participants) fill in the following form:

   - Your weight: _____ (kilograms)
   - Multiply your weight by 2:_____ (kilograms)
   - Divide your answer to question 2 by 3. This is the number of kilograms of water in you:_____ (kilograms of water)
   - Divide your answer to question 3 by 2. This is the number of litres of water in you:_____ (litres of water)

4. Ask each participant to share how much water is in his or her body!

Discussion

Why does the human body need water?
How does the human body obtain the water it needs?
Who else needs water?

Source: Incredible Water with the Water Lion, 4-H Water Project Unit 2, page 3
http://extension.psu.edu/4-h/members/projects-resources/environmentaled/water/IncredibleWater.pdf

Water is the Way to Go

Level 1 2

Aim

To learn why water is vital for the well-being of all forms of life.

Materials

An outdoor setting, coloured paper, colour markers.

Time

30 minutes.

How to do it

1. Use the coloured paper to write some ideas about why water is important for our lives. Cut and fold each idea.
2. Hide each idea around the garden or playground.
3. Explain to the participants that they must look for the pieces of paper you hid. The person that finds more papers is the winner!
4. Have each participant read out loud their ideas and discuss with them what they think about those statements.

Here are some ideas:

- About 70 percent of our body is made out of water.
- 90 percent of human blood is water.
- Water regulates our body's temperature.
- We need to drink water to survive and to stay healthy.
- Water helps move **nutrients** through our cells.
- Water keeps the moisture intact around mouth and eyes.
- We need water to digest our food and get rid of waste.
- Human beings should drink at least eight glasses of water each day.
- A human being can spend one month without food, but only five to seven days without water.
- We need water for our everyday activities, such as cooking, cleaning, bathing, etc.
- Water helps our plants and trees to grow.
- Animals need water to grow and be healthy.
- There is more animal and plant life found in water than on land.
- Many of the things we use are manufactured using water, such as clothes, toys, paper, etc.
- The food we eat is also made of water, watermelon, for example, is almost 100 percent water.
- Living beings need water for recreation and fun.

Discussion

Did you know water gave you so many benefits?
Can you name other benefits all living beings obtain from water?
Can you tell us about a fun experience you had where water was involved?

Water Trivia Matching Game

Level 1 2 3

Aim

To learn some interesting facts regarding water.

Materials

Copies of the matching game, pencils.

Time

30 minutes.

How to do it

1. Remind your group how water is a vital resource that is the basis of life as it is essential for the survival of all known life forms, and it is also necessary to carry out our everyday activities.
2. Give a copy of the **Water Trivia Matching Game** to each participant and give them some time to complete it.
3. Review the answers as a group.

Discussion

Why is water indispensable for all living beings?
How would life change if there wasn't enough water for all living beings?
Can you describe some things we can do to protect water?

Water Trivia Matching Game

Match each question to its correct answer.

a) How much of a chicken is water?	70 percent
b) What percentage of the Earth's surface is covered by water?	95 percent
c) How much of a pineapple is water?	1.7 percent
d) How much of fresh water is found in the ground?	Approximately one week
e) How much of an elephant is water?	68,7 percent
f) How much of the world's water is frozen?	70.9 percent

g) How much of a watermelon is water?	75 percent
h) How long can any person live without water?	80 percent
i) How much of the Earth's fresh water is trapped in glaciers?	Almost 100 percent
j) How much of human blood is composed of water?	30 percent

Source: United States Environmental protection Agency, Water, Education and Training, Water Trivia Facts, http://water.epa.gov/learn/kids/drinkingwater/water_trivia_facts.cfm

Answers:

a)75 percent, b)70.9 percent, c)80 percent, d)30 percent, e)70 percent, f)1.7 percent, g)Almost 100 percent, h)approximately one week, i)68.7 percent, j)95 percent

Water's Three Forms

Level 1 2

Aim

To learn about the three states of water.

Materials

Ice cubes, a pan with its lid, stove.

Time

40 minutes.

Background

When two very tiny particles, called **atoms**, of hydrogen and one oxygen **atom** combine, they produce one **molecule** of water. A **molecule** is two or more **atoms** bonded together to make a substance. One drop of water contains billions of **molecules** of water.

Water is the only substance that occurs naturally on Earth as a solid, liquid, and gas. The space between water **molecules** determines whether water occurs as a solid, liquid, or gas. When the **molecules** are closest together and lined up neatly, water occurs as solid ice. When the **molecules** are farthest apart and jumbled, water occurs as a gas. We call this gas 'water vapor.' While water vapor itself is actually invisible, you can 'see' water vapor as the steam rising from a pot of boiling water or as your breath on a cold day. When the distance between water **molecules** is midway between the solid and gas states, and the **molecules** are slightly jumbled, water occurs as a liquid.

How to do it

1. Explain to your group that you are going to make a small experiment that will allow you to see water in its three states: solid, liquid and gas.

2. Ask the participants to help you place some ice cubes in a pan. ***Be very careful while you heat the water in the pan to boiling.***
3. Have the participants watch the ice melt into water. Water boils at about 212 degrees Fahrenheit (°F). This temperature is the same as 100 degrees Celsius (°C).
4. Next, ask your group to see water evaporating as steam (or water vapor) while the water boils. Hold the pan's lid over the pan. As water vapor comes in contact with the lid, which is cooler than the pan, water drops form. This is **condensation**. You have now seen water change from solid to liquid, to gas, and back to liquid again.

Discussion

Which is your favorite state of water? Why?
Why is water needed in all three states?
Why is each state of water important for the **water cycle**?

Source: Incredible Water with the Water Lion, 4-H Water Project Unit 2, Section 2, Water's Three Forms, http://extension.psu.edu/4-h/members/projects-resources/environmentaled/water/IncredibleWater.pdf

The Water Cycle

Level 1 2 3

Aim

To demonstrate how the **water cycle** works.

Materials

A large glass or clear plastic kitchen bowl, plastic food wrap, a small stone or marble, a clean jam jar (small enough to fit completely inside the bowl), some water-soluble ink or paint, dirt, water, a sunny day.

Time

One hour to set the experiment; and, after the bowl spends some hours on the sun, 20 minutes to review the outcome.

Background

Our world has a limited amount of water, and the amount of water we have now is the same our Earth had when dinosaurs existed! The **water cycle** refers to how the Earth's water recycles itself, and it is made up of different parts:

- ***Evaporation:*** the sun heats up the water in the ocean, rivers or lakes and turns it into vapor or steam. This water vapor goes into the air. This is the process when liquid changes into a gas.
- ***Condensation:*** the water vapors rise up and when they reach cooler layers of the **atmosphere**, they form tiny droplets in a process called **condensation**. Clouds are large collections of these very tiny droplets of water, and in some cases, tiny crystals of ice. This is the process when a gas is changed into a liquid.
- ***Transpiration:*** plants lose the water they absorb from the soil through their leaves; this water is then evaporated and sent back up into the air.
- ***Perspiration:*** animals also lose water through sweat, for example, by exercising or in a really hot day.
- ***Precipitation:*** when too much water has condensed, the air cannot hold it anymore. The small droplets of water in the clouds form larger droplets and water

falls back into the earth in the form of rain, hail, sleet or snow.

- ***Infiltration:*** when water falls back into the land, this water can soak into the ground through the soil and become part of the **groundwater**.
- ***Runoff:*** some of the water that falls back into the earth runs over the surface of the land and flows down hill into rivers, streams, lakes or oceans.

How to do it

1. Explain to your group that you are going to make an experiment to help them understand how the sun makes the world's **water cycle** work, and how the **water cycle** helps to purify water.
2. Sit the jam jar in the middle of your bowl.
3. Add some water to the bowl, ensuring that the jar doesn't start to float. Add a few drops of ink to the water to colour it, and gently mix it in.
4. Cover the top of the bowl securely but slightly loose with the food wrap; there should be a little 'give' left at the top, but not too much.
5. Place the stone directly above the jam jar (if you've got the tension of the cover right, this should mean that the weight of the stone makes a little depression in the plastic film) centered over the open mouth of the jam jar.
6. Stand everything in direct sunshine, wait and watch.

    * You could also try this experiment using water mixed with dirt, after the bowl spends some hours on the sun, the jam jar should contain relatively clean water and the bowl should contain the dried dirt.

Note:

As the sun warms the bowl, the water inside begins to heat up and as its temperature rises, it starts to evaporate. The water vapor produced condenses on the internal surface of the plastic film, forming tiny droplets, and once they get large enough, they run down the underside of the film, to the low point created by the weight of the stone. As more and more collect, eventually the drops become too heavy to stick onto the film any longer, and 'rain' falls into the open mouth of the jam jar. A careful look should also reveal that the water collecting in the jar is clear, not coloured - the ink is being left behind, just as the salt is left behind in the sea water. Minerals like salt and other substances dissolved in water are left behind during **evaporation**; as a result, when the water vapor condenses to become water again, it is relatively pure.

- ***You can find a colourful and fun water cycle diagram on the following link:***
  http://ga.water.usgs.gov/edu/watercycle-kids.html

Discussion

What are the two processes responsible for purifying the water? (**Evaporation** and **condensation**).

How does this process work on Earth?

If the plastic wrap represents the **atmosphere**, what would happen if the plastic wrap was dirty? (Air **pollution**).

Source: Eco Friendly Kids, Simple Solar Experiments for Schools, Making Your Own Rain,
www.ecofriendlykids.co.uk/simple-solar-experiments-for-schools.html

Let it Rain!

Level 1 2 3

Aim

To discover and enjoy nature during rain.

Materials

A rainy day, an outdoor setting.

Time

20 minutes.

How to do it

1. Explain to your group how fun it can be to play outside while it is raining, of course if it is not too heavy, if there is no lightning and if it is not too cold. You can tell them to wear some raincoats and boots or maybe not, getting soaked is even more fun!
2. Take your group to play outside. You can try different games and activities:
   - Racing under the rain. (Be sure not to slip though!)
   - Jumping in a puddle to see who can make the biggest splash.
   - Closing your eyes and listening to the sound of the raindrops, maybe you can make up a song to imitate that wonderful sound of nature.
   - Setting up a new musical instrument for the water to play, you could arrange a bunch of metal cans or pots in a line, for example.
   - Using some wet dirt to make a cool drawing on a thick piece of paper.
   - Making a drawing with some markers or water colours and taking it outside so the rain can transform it into a new work of art.
   - Building a waterway putting some rocks, sticks or mud in its path.
   - Using some wet dirt to make a yummy 'chocolate cake.'

Don't worry about the rain, running around outside, rainy or not, is a very healthy thing to do, but make sure you dry yourselves and change your clothes when you are finished!

Discussion

How does nature change when it is raining? Does it look or smell different?
What happens to all the rain that reaches the ground?
What are the benefits of rain?

Source: National Wildlife Federation, Be Out There, Let It Rain,
www.nwf.org/Get-Outside/Be-Out-There/Activities/Play/Rainy-Day-Fun.aspx

Your Own Watershed!

Level 1 2 3

Aim

To create a **watershed** model and to understand the natural movement of water through it.

Materials

Big pan (metal or plastic), rocks (big and small), aluminum foil, water, food colouring.

Time

40 minutes.

Background

A **watershed** is all the area of land that sends rain into a common body of water, such as a river, a stream, a lake or an ocean. A **watershed** can be as small as the water draining into a puddle in the back yard or as big as the Pacific Ocean **watershed** in the United States. As humans, animals and plants live together in this area they depend on each other to survive, but human activities can have negative or positive effects upon the **environment**. Therefore, it is essential to reflect about water quality and the need to keep pollutants out of the water.

How to do it

1. Explain to your group that you are going to create a **watershed** model in order to understand how water raining on land can end up in a body of water.
2. Ask the participants to use the pan to create the **watershed** model. Tell them to make some hills and mountains using the rocks and the aluminum foil, they can simulate two parallel mountain ranges. Have them cover the entire pan with the aluminum foil to represent the land. It should be molded so that some parts are flat while other parts have bumps and uneven parts. The foil should slope downward so that there is an area at the end of the pan where water can collect.
3. Have the participants take turns creating rain by gently pouring some water near the upper slope of the land. Have everyone watch the water make its way through the land and collect at the bottom to show how water seeps down to the lowest level. You can increase the slope of the pan by placing a book under the upper end of the pan.
4. Next, explain to your group that you are going to consider how a body of water can be polluted by different materials found on land. Tell them the food colouring represents **pollution**. Place some of it on different spots on land and ask students to guess what will happen if it rains again. Have a participant pour some water again so that your group can watch the flow. Explain that this is called runoff, the water that flows off of land into a body of water and may carry pollutants with it. Point out that the food colouring may flow all the way to the body of water at the bottom.

Discussion

How does a **watershed** support people, animals and plants?
What are the effects of **pollution** in a **watershed**? And how could this **pollution** affect the **environment**?
Can you name some ways to reduce the negative effects of people on their local **watershed**?

Watershed Animals

Level 2 3

Aim

To identify animals that live in their **watershed** and to discover how they interact with the **environment**.

Materials

Five poster boards, colouring pencils, colour markers, internet access or books.

Time

One hour.

How to do it

1. Remind your group that **watersheds** not only allow an area for water to drain and seep into the ground, but they also provide important **habitat** for both aquatic and terrestrial wildlife.
2. Divide the participants into five groups. Explain that each one will have to choose an animal they can find in their **watershed** (aquatic or terrestrial) and make a poster board that contains the following information: distinguishing characteristics, **habitat**, food, reproduction, and, of course, water use.
3. Give the groups enough time to make a small research about their animal (using the internet or some books) and to make a fun poster board.
4. Have each group present their work.

Discussion

Why can we say that all living things in a **watershed** are part of a community?
What is your role in this community?
What changes can you make to protect your **watershed habitats**?

Frozen Fun!

Level 1 2 3

Aim

To understand how water reacts when it freezes.

Materials

Freezer, small plastic bottle, clear bowl, cup, rubber band, strainer, salt, ice cubes, water, drinkable water.

Time

30 minutes. It is a good idea to put another bottle of water and another cup of salty water into the freezer before you start the activity, so you don't waste time waiting for these to freeze.

How to do it

1. Ask your group the following questions. What happens to water when it freezes? Do the water particles or **molecules** get smaller and denser? Or do they take up more space or expand when they freeze? Well, you are going to help them find out.
2. Fill a disposable plastic bottle with water, put on the cap and put it in the freezer. As the water freezes into ice, what happens to the bottle's shape and size? Water is different from most liquids. Most of them shrink and get denser when frozen. But water doesn't. It takes up more space when frozen. That is, it expands.
3. Try another idea. Ask your group if they have heard people say, 'It's just the

tip of the iceberg.' That means only a small part of whatever they're talking about is clearly seen. And the saying comes from the fact that most of a chunk of floating ice -icebergs- lies below the surface of the water.

4. Fill a clear bowl with water and add some ice cubes. How much of each cube is above and how much is below the water? This happens because water is slightly denser as a liquid than as a solid.
5. Continue by asking your group if sea level rises when an iceberg melts. Put a rubber band around the glass to mark where the water level is. Then wait for the ice cubes to melt. Does the water level change? But, what happens when a glacier melts? Put some ice cubes in a strainer and suspend it above the water in the glass. As your 'glacier' melts, what happens to the water level?
6. Try this last experiment, mix salt into a clean cup of drinkable water and put the cup in the freezer. After the water has frozen, take the ice out of the cup. Rinse the ice off with tap water. Now taste the ice. When salt water freezes, it forms **freshwater** ice. This happens because ice is formed only from water **molecules**, that is, tiny particles made of hydrogen and oxygen. Salt is made of other things. So when salt water freezes, the salt itself doesn't freeze.

Discussion

How did your bottle experiment prove that frozen water expands?
Why didn't the water level rise when the 'icebergs' melted? And why did it rise when the 'glaciers' melted?
What other fun characteristics of water can you mention?

Source: National Wildlife Federation, Ranger Rick, Frosty Fun, www.nwf.org/Kids/Ranger-Rick/Activities/Outdoors/Science/Frosty-Fun.aspx

World's Longest Rivers

Level 2 3

Aim

To discover which are the longest rivers of the world and their many benefits to all living beings.

Materials

Internet access, ten poster boards, colouring pencils, colour markers.

Time

One hour to prepare the poster boards and another hour to make the presentations.

How to do it

1. Remind your group how rivers around the world bring life-giving water to millions of people, support their own unique **ecosystems** and flow across a variety of landscapes.
2. Ask the participants to work in couples. Explain that each one will have to do a small research about one of the world's longest rivers:

- Nile
- Amazon
- Yangtze
- Yellow
- Ob
- Congo

- Mississippi-Missouri
- Amur
- Yenisei-Angara
- Lena

You can find some information in the Our Amazing Planet web site:
www.ouramazingplanet.com/112-the-worlds-longest-rivers.html

3. Tell each group to make a cool poster board which includes general information about the river, the countries it flows through and any fun or particular fact they might want to include. Give them enough time to prepare themselves.
4. The next meeting, ask each couple to present their work of art!

Discussion

Can you name some of the benefits people receive from these rivers? (Transportation, development, agriculture, recreation, etc.)
Waterways are a shared resource, whose responsibility is it to conserve them?
Why do countries need to cooperate in order to protect transboundary waters?

Density Test

Level 2 3

Aim

To learn about water **salinity** and **density**.

Materials

A pitcher, a long spoon, three drinking glasses (all the same size), warm water, table salt, a spoon, blue and red food colouring, two identical soda bottles with a regular neck (not wide), an unsharpened pencil, a funnel (that fits inside the top of the soda bottle), a ruler.

Time

One hour.

Background

Freshwater and seawater have two important differences. One is **salinity**, which means how salty a solution is. Ocean water has greater **salinity** than **freshwater**. The other difference between **freshwater** and seawater is their **density**. **Density** refers to the amount of 'stuff' in a given space or packed in a space. For example, a pan containing a fluffy angel food cake would have a lower **density** than the same size pan filled with a fudge cake. The **salinity** of water affects its **density**. The saltier water is, the denser it is.

How to do it

1. Explain to your group that you are making an experiment to compare three solutions with different levels of **salinity**, or salt. By using food colouring they will be able to observe which solution is the densest, and which is the least dense. Tell them that they will also investigate how a liquid's **density** affects objects that are put into it.
2. Start the activity by reminding them that the place where the lower end of a river meets the ocean is called an estuary. Ask them to think what happens

when the gush of **freshwater** collides with the gush of the ocean's tides? Do the two kinds of water instantly mix?

3. Begin the activity. Half fill the pitcher with warm water. Add a spoonful of salt, stir well and wait until the water is still. Do you see any salt at the bottom of the pitcher? If so, go to the next step. If not, keep adding salt slowly until the salt begins to collect on the bottom. The water is now saturated with salt.
4. Half fill two glasses with the solution. Each glass should have the same amount. Put one glass aside and put enough blue food colouring into the other glass to turn the liquid dark blue and stir well. This glass of blue solution represents salty ocean water.
5. Fill a third glass halfway with warm water. This glass represents fresh river water. Next, take the glass with the blue solution (ocean water) and SLOWLY pour it into the glass of warm water (river water). This thick solution will pour like syrup. The trick is to pour it gradually at the edge of the glass, don't mix the solution, just let it sit. What happens? Which liquid is denser, the blue one (salty ocean water) or the clear one (fresh river water)?
6. Take the other glass that you put aside earlier, half-filled with the saturated solution. Add some warm water to it until the glass is full. Then, put in enough red food colouring to turn the solution into a deep red, and mix well. This glass is filled with a liquid of medium **salinity**, less salty than the blue water, but saltier than the **freshwater**.
7. What do you think will happen if you SLOWLY pour a small amount of this red solution into the glass with the blue and clear water? Make a prediction and then try it out. What happened?
8. Make more saturated solution and use the funnel to pour this solution into a soda bottle. Fill an identical soda bottle with warm water (without salt).
9. Put an unsharpened pencil (eraser side down) into each bottle. What happened? Use a ruler to measure the difference. Measure from the base of the bottle up and see which the greater distance is. In which condition is the pencil higher in the water column? In which kind of water did the pencil have greater buoyancy, **freshwater** or saltwater? Buoyancy means how much something will float.

Discussion

What happened when you mixed the **freshwater** with the saltwater? Did the **freshwater** float on top of the saltwater? Or did the saltwater float on top?
Which do you think is easier for you to float in, a swimming pool or the ocean?

Source: American Museum of Natural History, Ology, Biodiversity, Test Density with a Supersaturated Solution, www.amnh.org/ology/biodiversity#features/whatdoyouknow_bio/?TB_iframe=true&height=450&width=750

The pH Scale

Level 2 3

Aim

To understand what pH is and to measure the pH of common substances.

Materials

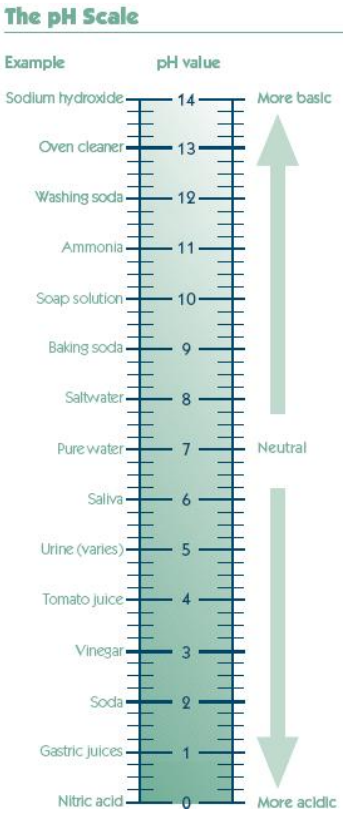
A pH test kit or litmus paper, eight clear cups, one tablespoon of each of the following liquids: vinegar, orange juice, coffee, milk, water, baking soda (dissolve a clump about the size of a pea in one tablespoon of tap water), milk of magnesia.

Time

One hour.

Background

pH (the power of Hydrogen) is an example of a chemical water quality criterion; it is a measure of how acidic or basic a substance is. pH is measured on a scale of 0 to 14. A pH of less than seven indicates acidity (a substance with a pH of six is ten times more acidic than a substance with a pH of seven). A pH greater than seven is basic or alkaline (a substance with a pH of eight is ten times more basic than a substance with a pH of seven). A pH seven is considered neutral -neither acidic nor basic.



Water that is acidic can have several negative effects. It could contain high amounts of metals that make the water taste metallic. Acidic water flowing through lead drinking water pipes will dissolve lead into the water, potentially causing a lead poisoning hazard. Certain metals, such as aluminum, become soluble in acidic water and can be harmful to fish. Dissolved aluminum can kill fish by damaging their gills and decreasing the level of sodium in their blood. Fish eggs and young fish are also very susceptible to acidity and toxic metals.

How can we change the pH of water? Acidity can be reduced by adding a basic substance such as baking soda or crushed limestone. Acidity can be increased by adding an acid.

How to do it

1. Explain to your group that all liquids have a pH level. pH (the power of Hydrogen) is an indicator of water acidity or alkalinity.

   Remind the participants that they are performing scientific tests and they are never to drink an unknown substance!

2. Demonstrate how to conduct a pH test and how to read the results.
3. Divide the participants into seven groups and assign one of the substances named above to each one. Ask each group to measure 1 tbsp of their substance into a separate cup.
4. Have each group test the pH of their substance with the pH test kit or litmus paper.
5. Record your results in the table below.

Substance	pH
Vinegar	
Orange juice	
Coffee	
Milk	
Water	
Baking soda	
Milk of magnesia	

* *You could also try testing the pH of the stream nearest you and how it varies from its source to its mouth, or at other points along the stream.*

6. As a final wrap up conversation, explain that many factories around the world burn **fossil fuels** like coal, oil and gas, which release sulfur dioxide and nitrous oxide into the air. When these chemicals mix with **precipitation** like rain and snow they fall as **acid rain**. How do the participants think **acid rain** will affect their community?

Discussion

How much variability in pH do you see?
Which substances are acidic and which are basic?
What would happen if a train car carrying baking soda derailed on a rainy night? How would it affect the nearby water sources and the creatures that depend on it?

Adapted from: Water Quality Matters!, 4-H Water Project Unit 3, page 16.

Explore a Pond

Level 1 2 3

Aim

To explore the life of an aquatic **ecosystem**.

Materials

A visit to a pond, strainer or dip net, shallow white plastic pan, small white plastic containers, white plastic ice-cube trays or plastic egg containers, plastic eyedropper, small paintbrush, hand lens or magnifying glass, nature journal and pencil.

Time

Two hours.

Background

An **ecosystem** refers to a 'community' where living creatures, such as plants and animals, and non living elements, such as water and soil, interact with each other and share their space, land and **climate**. Aquatic **ecosystems** make up a large portion of the world's **ecosystems** and can be classified as **freshwater** or marine **ecosystems**. The inhabitants of these **ecosystems** are specially adapted to live

and thrive under the particular set of conditions presented by those **ecosystems**. Learning about aquatic **ecosystems** is important to understand how life operates and how other species are dependent on each other and the **environment** around them for their survival.

How to do it

Before this activity, make sure you take the necessary safety precautions, especially when working with small children.

1. Explain to your group that you are exploring an aquatic **ecosystem**, a nearby pond. Ask them to wear proper clothes; it might be a good idea to wear some old sneakers or rubber boots.
2. To start, ask your group to observe the general landscape. What do they see? What relationships appear to exist between the living and non living elements?
3. Next, approach the pond slowly so you don't scare away the creatures near the water. How many can you see? What are they doing? Are any creatures flying over the water? Swimming in the water or moving along the bottom? (For a clear underwater view, you can use a face mask or a homemade water scope). Search plant stems and look under rocks and logs near the water's edge.
4. Ask the participants to fill the pan and containers with water and set them in a shady spot. Next, have them use the net or strainer to catch small fish, insects, and other tiny creatures. Try these ideas: look in different places, at the surface, along the shore, across the bottom. Check for wiggly creatures in the muck as the water runs out. Hold the net just under the surface. Have a participant hold a rock or branch in or right over the net and gently swish off any clinging creatures into the net.
5. Empty whatever you find into the pan or containers. Next, you can see them better by filling an ice-cube tray or plastic egg container with clear water and transferring the creatures from the collecting containers to the tray. An eyedropper or paintbrush works well to pick them up, one at a time. Put each kind of creature in a separate section of the tray. Now see if you've captured something that: has no legs, has six legs, has a shell, has a tail, is red, is green, wiggles, etc.
6. Be sure to let everything go. Gently lower the containers to the water and let all the creatures swim out!

Discussion

Which relationships where you able to identify between living and non living elements?

What **organisms** rely on water for survival?

How important is it to maintain a healthy and clean **environment**? Who is responsible for this?

Adapted from: National Wildlife Federation, Ranger Rick, Explore a Pond, www.nwf.org/Kids/Ranger-Rick/Activities/Outdoors/Observing-Wildlife/Explore-a-Pond.aspx

Macro-invertebrate Bioassessment

Level 2 3

Aim

To investigate the role that aquatic macro-invertebrates play in determining water quality.

Materials

Three Copies of the Macro-invertebrate Data Sheet 1 and the Macro-invertebrate Data Sheet 2 (one per group), materials for the bioassessment (similar objects may be substituted):

- Three plastic tubs or storage bins (to represent the streams)
- Three smaller plastic tubs (collection buckets)
- Three aquarium nets (the participants can use their hands or other scoop)
- Three sorting devices (ice cube trays, petri dishes, cups)
- Three calculators
- 100 small paper clips
- 50 large paper clips
- Six different sizes, shapes or colours of beads - 50 of each size/colour/shape
- 50 thin rubber bands
- 50 thick rubber bands
- 50 coins

Time

One hour.

Background

The water quality of a stream can be determined in several ways. Water quality can be compared relatively between several water sources, or can be measured absolutely. Biological, chemical and physical factors can all indicate the quality of the water.

One important way to determine the status of water's living systems is through biological assessment (bioassessment), which is the use of biological surveys and other direct measurements of living systems within a **watershed**. Aquatic macro-invertebrates (animals without backbones that live in aquatic **environments** and are large enough to be seen without the aid of a microscope or other magnification) are commonly monitored as they are valuable indicators of the health of aquatic **environments** in part because they are benthic, meaning they are typically found on the bottom of a stream or lake and do not move over large distances. Therefore, they cannot easily or quickly migrate away from **pollution** or environmental stress. Because different species of macro-invertebrates react differently to environmental stressors like **pollution**, sediment loading and **habitat** changes, quantifying the diversity and **density** of different macro-invertebrates at a given site can create a picture of the environmental conditions of that body of water.

If exposed to an environmental stressor (for example, **pollution**, warming due to low flows, low dissolved oxygen due to algal blooms, etc.), those macro-invertebrates that are intolerant to that stress may perish. Tolerant macro-invertebrates often inhabit the spaces left by the intolerant **organisms**, creating an entirely different population of

organisms. For example, an unimpacted body of water will typically contain a majority of macro-invertebrates that are intolerant of environmental stressors, such as mayflies (*Ephemeroptera*), stoneflies (*Plecoptera*) and caddisflies (Trichoptera). A body of water that has undergone environmental stress may contain a majority of macro-invertebrates that are tolerant of these conditions such as leeches (Hirudinea), tubifex worms (*Tubifex sp.*), and pouch snails (*Gastropoda*).

How to do it

1. Inform your group that they will be simulating a bioassessment of a stream using ordinary objects to represent macro-invertebrates.
2. Set up three sets of collecting stations, each containing the following: stream sampling site (fill three large plastic storage bins with 10 cm of water and label them Stream 1, 2, and 3), collection bucket and sorting trays.
3. Place objects representing macro-invertebrates in the three tubs according to the following chart:

Macroinvertebrate	Represented by:	Number of Items per Sample			Total Items
		Stream Sample 1	Stream Sample 2	Stream Sample 3	
Mayflies	Yellow beads	35	15	0	50 beads
Stoneflies	Small paper clips	65	35	0	100 clips
Caddisflies	Blue beads	30	20	0	50 beads
Dobsonflies	Large paper clips	30	20	0	50 clips
Midges	Red beads	0	20	30	50 beads
Craneflies	White beads	25	13	12	50 beads
Dragonflies	Green beads	20	20	10	50 beads
Scuds	Black beads	5	15	30	50 beads
Pouch Snails	Coins	0	15	35	50 coins
Tubifex Worms	Thin rubber bands	0	15	35	50 bands
Leeches	Thick rubber bands	0	15	35	50 bands

4. Divide the participants into three groups. Assign participants within each group to one of the following five tasks: stream sampling, sorting at the collection bucket, counting/recording on Macro-invertebrate Data Sheet I, and calculating/evaluating on Macro-invertebrate Data Sheet II.
5. Instruct the groups to simulate a rapid bioassessment at their stream sampling site as follows:
   a) Using an aquarium net, the students at the site have 20 seconds to collect as many macro-invertebrates (paper clips, beads, etc.) from the stream containers as possible. They should place the macro-invertebrates in the collection bucket.
   b) Students at the collection bucket then sort the collected macro-invertebrates into like categories based on the table above and place them in the ice cube tray or cups. For example, they should place all of the mayflies into one cube, caddisflies into another, etc.
   c) The students using the Macro-invertebrate Data Sheet I tabulate the sorting results onto the data sheet and calculate the percent composition of each macro-invertebrate in the stream site.
   d) The students with Macro-invertebrate Data Sheet II use the data from Data Sheet

I to complete the Pollution Tolerance Index to determine their Water Quality Assessment score for their stream sample.

6. Have the participants compare their results with the other groups.

Discussion

What were the similarities and differences between the three sites?
Which stream had the highest level of water quality? The lowest?
How do bioassessments help to define rehabilitation goals and to monitor trends?

Source: Water Quality Indicators: Biological, Physical and Chemical Parameters, World Water Monitoring Challenge, www.worldwatermonitoringday.org/uploadedFiles/Content/Resources/Water_Quality_Indicators_Update%20web.pdf

Macro-invertebrate Data Sheet I

Stream #:
Recorded by:
Date of Sampling:

Percent Composition of Major Groups

After the macro-invertebrates are sorted, tabulate the number of **organisms** for each of the major groups listed below and calculate their percent composition. This measure yields the relative abundance of macro-invertebrates within your sample.

$$\text{Percent Composition} = \frac{\text{Number of Organisms in Each Group}}{\text{Total Number of Organisms}}$$

Macro-invertebrates	Number of Organisms in Each Group	Percent Composition
Mayflies (Order *Ephemeroptera*)		
Stoneflies (Order *Plecoptera*)		
Caddisflies (Order *Trichoptera*)		
Dobsonflies (Order *Megaloptera*)		
Midges (Order *Chironomidae*)		
Craneflies (Order *Diptera*)		
Dragonflies (Order *Odonata*)		
Scuds (Order *Amphipoda*)		
Pouch Snails (Class *Gastropoda*)		
Tubifex Worms (Class *Oligochaeta*)		
Leeches (Class *Hirudinea*)		
Total Number of Organisms		

Macro-invertebrate Data Sheet II

Pollution Tolerance Index

1. Place a check next to each macro-invertebrate group present in your sample. For example, whether you found one mayfly or 50 mayflies, place one check next to the mayfly line in Group 1.
2. Complete the chart for all of the macro-invertebrate groups.
3. Calculate the group scores using the multipliers provided.
4. Total all of the group scores for your Total Score.
5. Compare your Total Score with the Water Quality Assessment Chart scores and record the relative water quality rating for your stream sample.

Stream #:

Recorded by:

Date of Sampling:

Group 1 Macroinverte-brates: Very Tolerant	Group 2 Macroinverte-brates: Intolerant	Group 3 Macroinverte-brates: Tolerant	Group 4 Macroinverte-brates: Very Tolerant
___Stoneflies ___Mayflies ___Caddisflies ___Dobsonflies	___Dragonflies ___Scuds ___Craneflies	___Midges ___Leeches	___Pouch Snails ___Tubifex Worms
# of checks = ___ x4 Group Score = ___	# of checks = ___ x3 Group Score = ___	# of checks = ___ x2 Group Score = ___	# of checks = ___ x1 Group Score = ___
Total Score = _____ Your Water Quality Assessment:		Water Quality Assessment Chart: ≥23 Potentially Excellent Water Quality 17-22 Potentially Good Water Quality 11-16 Potentially Fair Water Quality ≤10 Potentially Poor Water Quality	

Groundwater

Level 1 2 3

Aim

To understand what **groundwater** is and why it is important.

Materials

Three clear plastic cups, pea-sized un-coloured aquarium gravel, sand, water bottle spray nozzle, pieces of nylon stocking or tight, pitcher, clear salad bowl, light-blue food colouring, water.

Time

One hour.

Background

Water that falls to the earth in the form of rain, snow, sleet, or hail continues its journey in one of three ways: it might land on a water body and, essentially, go with the flow; it might run off the land into a nearby water body or storm drain; or it might seep into the ground. Water that seeps into the ground moves in a downward direction because of gravity, passing through the pore spaces between the soil particles until it reaches a soil depth where the pore spaces are already filled, or saturated, with water.

When water enters the **saturated zone**, it becomes part of the **groundwater**. The top of this **saturated zone** is called the **water table**. The **water table** may be very close to the ground surface, which is often the case when it is adjacent to a water body, or it may be as much as 60 to 200 metres deep. A water-bearing soil or rock formation that is capable of yielding enough water for human use is called an **aquifer**. In bedrock **aquifers**, water can move through cracks, or fractures. How quickly water passes through, or infiltrates, the soil is a function of the size and shape of the soil particles, the amount of pore space between the particles, and whether or not the pore spaces interconnect. For example, soils that consist primarily of larger sand and gravel particles tend to have larger, interconnected pore spaces that allow water to flow easily and relatively quickly. In contrast, some soils, such as silts and clays, have poorly connected pore spaces, a soil structure which tends to slow down infiltration.

When infiltrating water reaches the **water table**, it begins to move along with the **groundwater** flow, which tends to follow a downhill, or down slope, direction. Compared to water in rivers and streams, **groundwater** moves very, very slowly, from as little as a fraction of a metre per day in clay to as much as 1 metre per day in sand and gravel. In time, **groundwater** 'resurfaces'-perhaps when it intersects with a nearby water body, such as a stream, river, lake, pond, or ocean; or perhaps when it emerges from a hillside as a spring. Another way **groundwater** resurfaces is when it is withdrawn from the ground by way of a well. Wells are drilled and installed to capture **groundwater** and pump it to the surface.

How to do it

1. Take your group outside onto the school grounds. Ask them to think about the last time it rained. Where did the water go when it fell on pavement? On roofs? On soil?
2. Take a cup of water and ask a participant to pretend it is rain. Have the participant pour the water on unpaved ground. What happens to the water? First, it makes a

puddle. Then, it soaks into the ground.

3. Discuss what might be happening to that water once it disappears into the soil.
4. Next, ask your group to think of the cup and sand and gravel models that they are about to make as part of a **groundwater** system. Explain that the bottom of the cup is similar to the bedrock or clay that is found beneath the earth's soil layers.
5. Have a participant fill one clear cup 3/4 full with gravel and the other with sand. Ask the group to describe the spaces (pores) between the gravel and between the sand.
6. Tell another participant to pour water slowly into each of the cups until it reaches the top of the gravel or sand (not the top of the cup). Where is the water? Explain that when we refer to **groundwater**, we are talking about the part of the soil where all the pore spaces are filled, or saturated, with water.
7. Explain that when it rains, some of the rain (or other **precipitation**) flows into the soil and moves through the spaces or pores between the particles. As water flows through the soil, it eventually reaches an impermeable layer of rock or clay and begins to fill the pore spaces of the soil.
8. To demonstrate where **groundwater** (the **saturated zone**) begins, have a participant fill another cup to nearly the top with gravel. Ask him or her to gently pour in the water until the cup is half filled with water. Explain that the **water table** is the place where the soil becomes saturated and the drier sand or gravel ends. Water found below the **water table** is called **groundwater**. For older participants, you may want to mention that the area above the water line is called the unsaturated zone; the area that has every space filled with water is called the **saturated zone**.
9. Next, remind your group that many people use **groundwater** as a source of drinking water or as a source of water for crops/plants. Explain that wells are used to pump water out of the ground.
10. To make your well, ask a participant to cover the bottom of the tube of a spray nozzle with a piece of nylon stocking. Secure the stocking with a rubber band.
11. Tell another participant to put the spray nozzle into an empty cup and to fill the cup 3/4 full with gravel. Pour water into the cup until it reaches the top of the gravel (not the top of the cup). The sprayer is used to simulate pumping water through a well.
12. Have a participant pump water through the spray nozzle into another cup or into the sink. Why did we use the stocking at the base of the spray nozzle? To keep sand and gravel from being pumped into the tube. Real wells have screens too.
13. Finally, explain that you are going to examine the **groundwater/surface water** connection. Ask a participant to put a layer of un-coloured aquarium gravel in a clear salad bowl (about 8 cm deep) and to dig a hole (depression) in the gravel, so that when water is added the group can see the **water table** (the thoroughly wet gravel, or **saturated zone**, versus the area that is dry or just damp) as well as the relationship between **groundwater** and **surface water**.
14. Then, ask a participant to add light-blue food colouring to a pitcher of water and tell him or her to gently pour the water into the bowl at one edge until it saturates 3 cm of the gravel throughout the bowl. What happens? The water will seep into the hole.
15. Explain to your group that when people dig a big hole in the ground it slowly fills up with water and becomes a man-made pond or lake. Where does the water come

from? **Groundwater** flows into the hole.

Discussion

What is the role of **groundwater** in nature's **water cycle**?
How important is **groundwater** for human beings?
How can we protect **groundwater**?

Source: Environmental protection Agency, Deep Subjects, Wells and Ground Water, www.epa.gov/region1/students/pdfs/ww_well.pdf

Yummy Aquifer

Level 1 2

Aim

To learn about the geologic formations in an **aquifer**, how **pollution** can get into **groundwater** and how pumping can cause a decline in the **water table**.

Materials

Blue/red food colouring (or substitute with red, grape or orange soda); vanilla ice cream; clear soda pop; small gummy bears, chocolate chips, crushed cookies, cereal, crushed ice or other material to represent sand and gravel; variety of coloured cake decoration sprinkles and sugars; drinking straws; clear plastic cups; ice cream scoop; spoons.

Time

40 minutes.

Background

When rain falls to the ground, the water does not stop moving. Some of it flows along the surface to different water bodies such as streams or lakes, some of it is used by plants, some evaporates and returns to the **atmosphere**, and some sinks into the ground.

Groundwater is water that is found underground in the cracks and spaces in soil, sand and rock. **Groundwater** is stored in -and moves slowly through- layers of soil, sand and rocks called **aquifers**. **Aquifers** consist of gravel, sand, sandstone, or fractured rock. These materials are permeable because they have large connected spaces that allow water to flow through. The speed at which **groundwater** flows depends on the size of the spaces in the soil or rock and how well the spaces are connected.

The area where water fills the **aquifer** is called the **saturated zone**. The top of this zone is called the **water table**. The **water table** may be located only a metre below the ground's surface or it can sit hundreds of metres down. The **water table** may be deep or shallow; and may rise or fall depending on many factors. Heavy rains or melting snow may cause the **water table** to rise, or heavy pumping of **groundwater** supplies may cause the **water table** to fall.

How to do it

1. Explain to your group that you are constructing an edible **aquifer**!
2. Ask the participants to help you build their **aquifers**:
   - Begin by filling a clear plastic cup 1/3 full with gummy bears, chocolate chips and crushed ice, which will represent the gravel, sand and rocks.

- Add enough soda to just cover the candy/ice. This is the **groundwater**. See how the 'water' fills in the spaces around the gravel, sand, and rock.
- Add a layer of ice cream to serve as a 'confining layer' over the water-filled **aquifer**. Discuss what a confining layer is/does (a confining layer is usually made of clay or dense rock. The water is confined below this layer).
- Then add more gravel and sand on top of the 'confining layer.'
- Finally, decorate with some coloured sugars and sprinkles to represent the porous, top layer of soil.

3. Next, have the participants add the food colouring to the soda. The food colouring represents contamination. Tell them to observe what happens when it is poured on the top of the "**aquifer**." Point out that the same thing happens when contaminants are spilled on the earth's surface.
4. Using a drinking straw, ask the participants to drill a well into the center of their **aquifers**. Tell them to slowly begin to pump the well by sucking on the straw. Watch the decline in the **water table**. Notice how the contaminants can get sucked into the well area and end up in the **groundwater** by leaking through the confining layer.
5. Finally, recharge the **aquifers** by adding more soda which represents a rain shower.
6. Review what you have learned as you enjoy eating your edible **aquifers**!

Discussion

Do people in your country use wells to obtain **groundwater**? Have you ever seen one?
What are some sources of **groundwater** contamination? (Pesticides, fertilizers, motor oil, septic tanks, landfill leachate, chemicals from mining, industry and leaking storage tanks are some examples).
Why is it important to avoid **groundwater** contamination? Can this contamination affect **surface water**? (**Groundwater** and **surface water** are connected; water can move from one to the other, a lake, for example, is under the direct influence of **groundwater**).

Source: The Groundwater Foundation, Activities, Try This, Edible Earth Parfaits, www.groundwater.org/kc/activity5.html

Wetland Model

Level 2 3

Aim

To learn what a wetland is and describe its functions.

Materials

Whiteboard, modeling clay, oasis (florist foam), roasting pans, small piece of indoor-outdoor carpeting, sponges, pine needles, twigs, grass, weeds, soil, and other natural materials, cotton swabs (optional), toothpicks (optional), cardboard, glue, scissors, paper and pencils, markers, whiteboard markers, pictures of wetlands and wetland plants and animals, jar of muddy water, water, reference books, poster paints.

Time

One hour.

Background

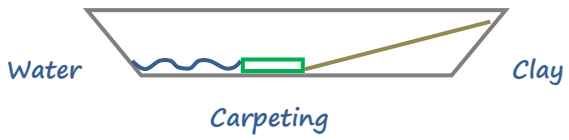
Wetlands are unique **habitats** which possess very special characteristics as they lie at the interface of terrestrial and aquatic **habitats**. They present an incredible mixture of species, conditions, and interactions. Wetlands are among our planet's most diverse and varied **habitats**.

Wetland soils are shaped by water. These soils, known as hydric soils, are saturated or even submerged all or part of the year. Wetlands help filter silt and pollutants from water, help prevent soil erosion and often reduce **flood** damage.

The high level of **nutrients** and the availability of water make wetlands an ideal **habitat** for fish, amphibians, shellfish, and insects. Moreover, many birds and mammals rely on wetlands for food, water and shelter.

How to do it

1. Explain to your group that you are building a wetland model in order to show them how some of the important wetland functions work.
2. Spread a layer of modeling clay in half of the roasting pan to represent land. Leave the other half of the pan empty to represent a lake or other body of water, such as a river or ocean. Shape the clay so that it gradually slopes down to the body of water.



3. Smooth the clay along the sides of the pan to seal the edges, you can also form meandering streams in the clay that lead into the body of water.
4. Cut a piece of indoor-outdoor carpet to completely fill the space across the pan along the edge of the clay. The carpeting represents the wetland buffer between dry land and open water.
5. Begin the activity by asking your group to list the characteristics of a wetland. Write their answers on the whiteboard and take a group survey to decide which characteristics might apply to all wetlands.

6. Next, show your group some pictures of different types of wetlands, including **freshwater** and salt marshes, **freshwater** swamps, mangrove swamps and bogs. Have them think about the animals that might live in the different types of wetlands.
7. Now, demonstrate some of the functions of a wetland using the model:
   - ***Flood control:*** after fitting the piece of carpeting into the wetland area, pour some water slowly on the land. What happens? Some of the water is slowed down by the wetland (carpet) and the excess slowly flows into the body of water.

     Now, remove the carpeting and water. Pour the same amount of water on the model at the same spot and rate as before. Have your group note any difference. The water should fill the body of water much more quickly than before. That happens because it is no longer buffered by the wetland. Explain that most wetlands are shallow basins that collect water and slow its flow rate. This slowing process helps reduce **flooding** and also helps prevent soil erosion. In many coastal areas wetlands are drained and filled in, and houses or marinas are built right along the water. Without a wetland buffer, these developed open areas are often subjected to severe **flooding** and erosion, especially during violent storms.
   - ***Water purification:*** pour the water out of the model and replace the piece of carpeting in the wetland. Pour some muddy water from the jar onto the land. Ask your group to compare the water that ends up in the body of water with the water in the jar. Explain that the soil particles are trapped by the carpeting, making the water in the body of water much cleaner.

     Remove the carpeting, pour out the water and try the experiment again. What happens without the wetland in place? Why do all the dirt particles end up in the body of water? The thick mat of plant roots in a wetland helps trap silt and some types of pollutants. Without a wetland excessive amounts of silt and pollutants can end up in lakes, rivers and other bodies of water.

8. Next, discuss how wetlands are important wildlife **habitats**, as well as important recreation sites for people.
9. Explain to your group that now they are helping you to make a complete wetland model. Instead of using carpeting to represent the wetland, have your group use oasis (florist foam). The participants can attach plants and animals to the model using toothpicks. They can make a **freshwater** marsh, a salt marsh, a **freshwater** swamp, a mangrove swamp or a bog. Have them decorate the model according to the type of wetland they choose. Here are some ideas:
   - For cattails, use cotton swabs painted in brown, pieces of grass or toothpicks painted in green with bits or brown clay stuck on the tops.
   - Use long pine needles for reeds.
   - Shape wetland creatures from clay or cut them from paper and glue them onto toothpicks.
   - Make trees by gluing pieces of green sponge onto twigs.

   You can now repeat the experiment to see it in action again!

Discussion

Have you ever been to a wetland? What did you enjoy about it?

What other functions of wetlands can you mention?
Why is it important to preserve these **habitats**?

Source: National Wildlife Federation, Eco-Schools USA, Wetlands Information and Activities, Wetland Models, www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Special-Report/Oil-Spill-and-Wetland-Activities.aspx

Your Own Rainstick!

Level 1 2

Aim

To make a fun rainstick.

Materials

Cardboard tubes (from rolls of paper towels or wrapping paper), colour markers, water colours, paper, tape, beads and feathers, glue, uncooked beans, rice.

Time

One hour.

Background

It is believed that the rainstick was invented in South America and it was played in the belief that it could bring about rainstorms. Currently the rainstick is used as a musical instrument that sounds like rain when you turn it from one end to the other. Traditionally, rainsticks are made from the wood skeleton of a cactus.

How to do it

1. Explain to your group that you are making some rainsticks to call the rain!
2. Have each participant cover one end of the tube with a double layer of paper to make it more resistant and tape it shut.
3. Tell them to pour a handful of rice and beans into the tube.
4. Ask them to cover the other end of the tube as they did before.
5. Have everyone decorate their rainsticks using watercolours, markers, beads, and feathers.
6. Go outside, shake your rainstick up and down and make a rain dance with your group!

Discussion

Does your rainstick imitate the sound of rain? Did your rain dance attract the rain?
What can this activity teach you about water and culture?
Why would people want to attract the rain?

Wonderful Waters

Level 2 3

Aim

To describe the relationship between humans and Earth's waters.

Materials

Large index cards, colouring pencils, colour markers, pencils, Internet access or print materials.

Time

One hour.

How to do it

1. Explain to your group that you are going to make an imaginary trip to different

natural water areas from around the world (if you prefer, you could also choose some natural areas from your country). Why do people visit these places?

2. Divide the participants into six groups and assign one of the following natural water areas to each one:
   - *Red Sea Reef*
   - *St. Paul's Subterranean River*
   - *Jaegala Fall*
   - *Great Blue Hole*
   - *Perito Moreno Glacier*
   - *Ross Ice Shelf*

3. Next, ask the groups to imagine they are visiting those places. What would they see? What are the conditions there? Distribute one index card to each group and explain that they are going to illustrate a postcard with an image on one side and a brief description on the other. The image can show any scene from their visit. The description should answer the following questions:
   - What is the name and location of your visit?
   - What are your role and the purpose of your visit? (Examples of roles might include engineer, tourist, biologist, scientist, or sailor).
   - How would you describe the place? (sights and sounds, plants and animals , and any significant structures).
   - What does this place reveal about Earth's waters?

   Provide appropriate print and/or online materials for students to learn more about their selected location.

4. Finally, have each group share their postcard with the rest of participants.

Discussion

What effect do these places have on people?
What effect do people have on Earth's waters?
Why is it important to understand Earth's waters?

Adapted from: Discovery Education, Teachers, Free Lesson Plans, Earth's Waters,
www.discoveryeducation.com/teachers/free-lesson-plans/earths-waters.cfm

Words of Wisdom

Level 2 3

Aim

To interpret and reflect about the meaning of traditional proverbs related to water.

Materials

Cardboard cards, colour markers, whiteboard, whiteboard markers

Time

40 minutes.

Background

Passed from generation to generation, proverbs are short sayings that reflect the values and beliefs of a culture. In many countries around the world, proverbs are used to teach a lesson or a moral, warn against foolish acts, guide conduct, help solve problems and bring special meaning to situations. Proverbs are used not only to instruct, but also to debate, tell stories and spice up daily conversation.

Proverbs have at least two, and sometimes more, meanings. One is the literal meaning, and the other is a figurative interpretation, in which the real teaching or truth is contained. The figurative interpretation is the symbolic meaning of the proverb. Formulating proverbs is an art form and understanding proverbs is often challenging. Consider the following proverb:

'**A watched pot never boils**.' Literally interpreted, this is a statement about a pot of water set out to boil. Figuratively and more broadly, it can mean that with patience one's desires will come to pass on their own time; impatience often seems to make one's desires take a long time.

How to do it

1. Before the activity, write the proverbs from the **Water Proverbs** list on separate cards. Do not write the meanings.
2. Ask the participants if they know what a proverb is (a sentence or saying that teaches a human value).
3. Discuss some common proverbs and their broad interpretation. Ask your group if these sayings should be taken literally. Ask the participants what 'interpretation' means (to provide a meaning of or explanation for something). Be sure to emphasize that proverbs have an important message in their interpretation.
4. Divide your group in half and explain that you are going to play a game. Ask for a volunteer to draw on the board. Give the volunteer one of the cards and have him/her draw a picture of the proverb from his or her card on the board while his/her group tries to guess what the proverb is.
5. Discuss the meaning of the proverb. What is the literal meaning and what is the interpretation?
6. Repeat the game with a volunteer from the other group. The group that has more correct answers is the winner!
7. Next, have the participants create their own proverbs about one of the following

topics: protecting existing water resources (keeping community water clean), washing hands (stopping the spread of disease), conserving water, or keeping trash contained in trash bins.

Discussion

How do proverbs communicate a meaning?
How useful do you think they are?
Which is your favorite proverb and why?

Source: Project Wet and UN Habitat, Healthy Water, Healthy Habits, Healthy People, Words of Wisdom, page 46, www.projectwet.org/pdfs/WASH/LAC_EdGuide_EN.pdf

Water Proverbs

Proverbs	Meaning
Just a drop in the bucket.	Something is only a small part of a bigger situation.
You don't miss the water until the well has run dry.	People don't appreciate what they have until it is gone.
Keep your head above water.	Don't give up during tough times; keep trying your best.
You can lead a horse to water but you can't make it drink.	People can only teach others –they cannot control others' actions.
It's water under the bridge.	Do not dwell on past situations.
Sink or swim.	A person must figure out how to succeed in order to survive.
A jug carries water until its handle breaks off.	Nothing lasts forever.
A watched pot never boils. Be patient.	Desires will come to pass on their own time.
April showers bring May flowers.	Tough situations bring positive results.
Like a fish out of the water.	Feeling or looking out of place in a situation.
When it rains it pours.	When something good or bad occurs, it usually occurs more than once and often within a short period of time.
We will cross the bridge when we get there.	Do not worry about problems before they arrive.

Useful resources

Environmental Education for Kids – Water Wonders
http://dnr.wi.gov/org/caer/ce/eek/earth/groundwater/index.htm

National Wildlife Federation - Kids
www.nwf.org/en/Kids.aspx

Teach UNICEF - Water and Environment
http://teachunicef.org/explore/topic/water-and-environment

The United States Geological Survey Water Science School
http://ga.water.usgs.gov/edu/

The Groundwater Foundation Kids Corner
www.groundwater.org/kc/kc.html

United States Environmental Protection Agency – Water: Kids
http://water.epa.gov/learn/kids/index.cfm

Using Water

Introduction

Did you use water this morning? We are sure you did! All living creatures need water to live. We need to drink water to stay healthy and we also need it to wash our teeth and hands. Water helps to make electric power and is it also used in making our clothes. The cookies and milk we eat need water to be produced. All animals drink water or eat plants that also depend on water to grow. People enjoy going to the pool or just being near the ocean. And, many different animals and plants live in or near water. Every day all living beings use water for a variety of different purposes.

Water is one of our world's most valuable resources, but it is also one of the **scarcest**. Some parts of the world have better access to clean, easily attainable water than others. In some places obtaining water is as easy as turning on the faucet, while in other places women and children must walk various miles every day to obtain water for their families. As population increases worldwide, the use of water in the domestic, agricultural and industrial sectors rises and the pressure on water resources intensifies. When water resources are degraded, they can impact every form of life, including human life. The challenge, therefore, is to overcome the need for competition and to find ways to harmonize the water requirements of people with those of the natural **environment**.

But, who needs to take action? Everyone on our planet is responsible for preserving water and preventing its **pollution**! Children and youth are especially capable of making wiser choices and persuading elder people to safe water and make sure that it is sustainably used and managed. Even the simplest activities can make a real difference to our world!

Activities

Where Does Your Water Come From?

Level 1

Aim

To learn that water comes from different sources.

Materials

A copy of the maze, pencils.

Time

30 minutes.

Background

When a person opens a faucet to drink a glass of water, he or she may be tapping a source close to home or hundreds of miles away. The fact that water falls from the sky makes it easy for many of us to think that there will always be enough to meet all of our needs. But before rain and snowmelt can reach our faucets, this water first flows over land into rivers, lakes and **aquifers**.

Water is then directed to pipelines and water **filtration** systems so your local water utilities administration can provide water to its jurisdiction. Over time, large distribution networks have been developed to pipe treated **surface water** and **groundwater** to homes, businesses, parks, schools and other facilities.

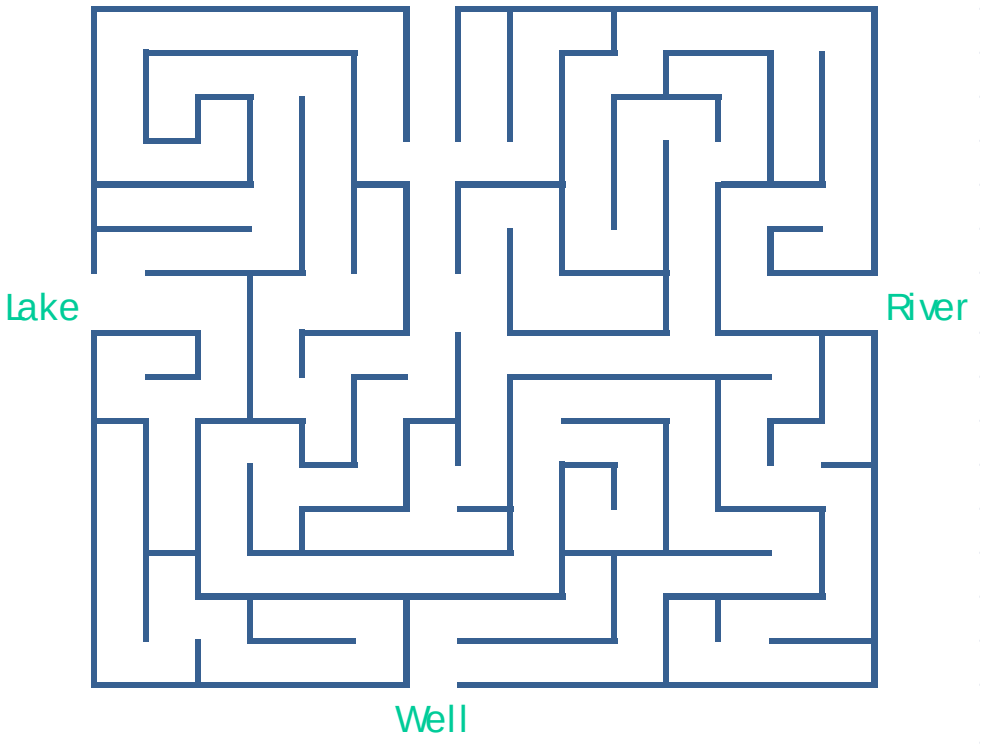
How to do it

1. Before the activity, it would be good to investigate where your water comes from, so children can have a better understanding on the subject.
2. Give each participant a copy of the maze.
3. Explain to them that, using the maze below, they must find their way from their home to the different water sources.

Discussion

What is the connection between water and the **environment**?
Why is it important to treat water before making it available for human use?
What can you do to prevent water **pollution**?

Where does your water come from?



Drawing source: Microsoft Office Images, http://office.microsoft.com/en-us/images

Fun With Water

Level 1 2 3

Aim

To enjoy a fun experience that involves using water.

Materials

Cardboard, colouring pencils, colour markers.

Time

15 minutes to explain the activity and an hour to review the outcomes.

How to do it

1. Remind your group how many wonderful things we do everyday involve the use of water and how happy water makes people all around the world.
2. Explain to your group that they will have a very fun home assignment! They will have to plan an activity, which involves the use of water, that they can develop with their family during the weekend. It can be anything, from going to the pool to fishing in a nearby lagoon!
3. In the next meeting, after they have already enjoyed their activity, ask each participant to talk about it. The younger participants can also make a nice drawing about their experience.

Discussion

Which activity do you think was the cleverest one? Why?
Do you think some activities might have had a negative impact on water? What can you do to avoid that?
Do you think everyone has the right to enjoy water? Why?

How Do You Use Water?

Level 1 2 3

Aim

To realize how water is used and why we need to protect it.

Materials

Whiteboard, whiteboard markers, large paper banner, colour markers, colouring pencils, water colours, adhesive tape, craft items to decorate the banner (felt, stickers, glitter, pipe cleaners, colour papers, etc.)

Time

One hour.

Background

Have you thought how the water of our planet is distributed? Out of the Earth's total supply of water, 97.5 percent is salt water and only 2.5 percent is **freshwater**. Furthermore, the amount of **freshwater** trapped in glaciers and icecaps is 2.2 percent, leaving only 0.8 percent of the Earth's total water available for everyday human use.

The water that is available for humans needs to be shared by everyone in the world, and therefore it is important not to waste it. Many areas in the world do not have access to safe, clean drinking water, so it is everyone's responsibility to use water wisely. Simple steps such as turning off the faucet and taking shorter showers can help to conserve the amount of water we use, so that we do not waste such a precious resource!

How to do it

1. Begin by discussing with your group how they use water in their daily lives. Have them list the things that they use water for and write them on the board as they are mentioned.
2. Also ask the participants to name other places besides their home where water is used. Have them think about how they are connected to those places (schools, hospitals, farms, factories, **sanitation** plants, etc.)
3. Talk with your group about the importance of conserving water since the entire world needs to share our water resources. Emphasize that it is important not to waste water because there is a limited amount available.
4. Have a discussion with your group about what they can do to conserve water. Brainstorm in general, or refer to the water uses listed previously on the board and try to think of one way to reduce for each use.
5. Using the large paper banner, have the participants think of a pledge that they all want to make together concerning their water use. This could be very broad such as, 'We pledge to use less water at home' or it could be specific such as 'We pledge to turn off the water when we brush our teeth.' Ask the participants to write the pledge in the center of the banner and to decorate it to make it look fun and appealing.
6. Finally, have each participant either trace, paint, or cut out and paste a copy of their hand and have them write or sign their name on/next to their handprints on the pledge banner. Hang it in the hallway so other groups can see and learn from it!

Discussion

Why is water **scarce** and why is it important to conserve it?
In what ways will you start using less water?

How can you involve your friends and family in this effort?

Source: Earth Day Network, Conserving Water Through Art!, http://eeweek.org/assets/files/EDN%20Water%20Lessons/Conserving_Water%20_K4.pdf

Water Twist

Level 1 2

Aim

To explore the connections between being a responsible citizen and water use.

Materials

Eight paper sheets, a bag, adhesive tape, colour markers, music.

Time

40 minutes.

Background

You can find water all around you, in the sky and in the ground. We use water every day, for example, when we brush our teeth, when we cook a soup or when we water our plants. Water is a precious resource, so learning how to care for it is very important.

Less than 1 percent of all the water on the planet can be used by people, the rest is salt water (from the oceans) or is permanently frozen and we can't use it. As the population grows, more and more people need to use this limited resource. Therefore, it is important not to waste it.

Moreover, because of **climate change** our planet's **weather** patterns are changing, temperatures are getting warmer and sometimes the rain does not fall where and when it is needed. That's a big problem because we all need water to live. For example, sometimes summers get so dry that people have to be extremely careful not to waste water because the amount of water in their dams gets very low.

Water conservation starts with you! If you are more careful with your water now, we will all have enough to drink in the future.

How to do it

1. Choose eight colour markers and use each one to make a happy face in each paper.
2. Assign one of the questions provided below to each colour (you can repeat the colours if you have more than eight participants or you can create more questions).
3. Stick the papers on the floor in the shape of a circle with space in between each one.
4. Explain the game. Each participant stands on a paper and when the music starts playing each one steps to the next square, this continues until the music stops. When this happens, each participant stands on the square and you randomly draw a marker out of the bag to determine who has to answer a question.
5. Give the participant (or participants) a short time to answer and continue playing.
6. Before you start again, remove the paper (or papers) that correspond to the colour that you already took out of the bag.
7. Continue this pattern until you get down to a winner.

Questions

- Why is water considered a precious resource?
- Do all living beings need water? Why or why not?
- Do human beings have the right to waste water? Why or why not?
- What do you think are our responsibilities regarding water?
- Why do we need water to lead a healthy and happy life?
- Do water use habits affect the **environment**? Why or why not?
- Do water use habits affect human health? Why or why not?
- What steps could human beings take to use water more efficiently?

Discussion

Do you think you waste water with your everyday activities? Why or why not?
What are you doing to save water?
What can you do to encourage others to do the same?

Be Wise About Water

Level 1 2 3

Aim

To learn how to use water wisely.

Materials

Cardboard, colouring pencils, colour markers, scissors.

Time

One hour.

How to do it

1. Remind your group how important it is to use water wisely as it is a vital resource that needs to be preserved.
2. Explain to your group that they are going to make some signs related to water - water saving tips or interesting facts about water. These signs will be placed all around your school or youth group.
3. Have all the participants give ideas and write them down.
4. Divide your group into three of four teams and have each group use the cardboards to create some really cool and appealing sings.
5. Put the signs around your school or youth group to encourage everyone to value and care for water.

Here are some ideas:

Bathroom

- When you turn the tap on, don't turn it the whole way, maintain a slow flow.
- Take a shower instead of a bath. Challenge your family to see who can shower the fastest.
- Close the water tap while brushing your teeth.
- Don't over fill the tub for a bath, use only about 12cm of water.
- Don't let the water be wasted while you are waiting for it to warm-up, catch it in a bucket and use it to flush the toilet.

Kitchen

- Close the water tap while soaping the dishes.
- When you get a glass of drinking water, take only as much as you will drink.
- Operate the dish washer only with a full load.
- Many brands of bottled water contain the same chemicals as tap water. So, if you know that your drinking water is safe, don't buy bottled water.
- By using the garbage disposal less often, you'll save water. Instead, you can start a compost pile for organic waste.

Garden

- It is better to water the garden early in the morning or late in the evening, rather than in the middle of a sunny day, because this is when more water is lost due to **evaporation**.
- Collect rain water and use it to water your plants, to flush the toilet or to wash your clothes.
- Place mulch around the bases of trees and shrubs and in flower and vegetable gardens. Mulch holds water in the soil and it also helps control weeds.
- Water the lawn long enough for water to seep down to the grass roots. A light sprinkling will not reach the roots and the water will just dry up.

Around the house

- When using the washing machine, wash only full loads of clothes.
- Wash your car using a bucket and a sponge instead of a running hose.
- Use a broom rather than the hose to remove waste from the driveway or sidewalk.
- Avoid splashing too much water out of swimming pools.

Interesting facts

- Water constantly moves or changes form, but the total amount of water does not increase or decrease, so the water you just drank could have been the drinking water of a dinosaur!
- A human being can spend one month without food, but only five to seven days without water.
- 11 percent of the world's population has no access to safe drinking water, so think about how lucky you are!
- A dripping tap may waste up to 50 litres a day. Check your house to make sure you don't have any!

Discussion

Whose job is it to preserve water?

Do you think you could spend a whole day without using water? Why or why not?

Do you think your family should be more water conscious? What can you do about it?

Leak Detectives

Level 1 2

Aim

To realize how much water can be wasted by a leaking tap.

Materials

Measuring cylinder, notebook, pencils.

Time

30 minutes.

Background

Many people do not check if there are any leaking faucets around their house! It is time they realize leaks waste water and money. When water is used and goes down the drain, it has to be cleaned before it can be returned to nature, and this costs money. When water goes down the drain without being used, it still has to be treated and, therefore, we are just wasting water and money.

A leak starts when pipes or faucets become old and worn. Many people don't worry much about the water lost from a leaky faucet. But if it is a big leak, it can really add up, so it needs to be repaired as soon as possible!

How to do it

1. Explain to your group that they will become **Leak Detectives** and that they must look around their school or youth group for leaking or dripping taps (if you cannot find one, set a faucet to a steady drip). Tell them not to forget to check outside faucets.
2. Once they find a leaking tap, ask them to place the measuring cylinder under the tap. One participant must keep time with a watch. Once a minute is up, take the measuring cylinder from the tap and note how much water is collected in it. This represents the amount of water that would have otherwise been saved, but now is wasted.
3. Now ask them to calculate how much water would be wasted in one hour, one day and one year!

   One hour ▸ … ml wasted in one minute x 60 minutes

   One day ▸ … ml wasted in one hour x 24 hours

   One year ▸ … ml wasted in one day x 365 days

   As you can see, even a little drip can add up to a large amount of wasted water! All it takes is time, so make sure you ask the school or youth group director to have that leaking tap fixed!

Discussion

Did you think that much water could be wasted by a dripping tap?
How do you feel knowing that this wasted water could be precious to other families in the world that do not have access to sufficient water?
Can you think of other ways how water can be wasted at school or youth group?
What can you do to avoid that?

Adapted from: United Nations Environment Programme, Tunza, Children, A Trip With Drip, http://unep.org/tunza/children/images/flash/a_trip_with_drip/start.swf

Personal Water Audit!

Level 2 3

Aim

To make an assessment of our own personal water usage.

Materials

Copies of the Water Audit, notebooks, pencils.

Time

15 minutes to explain the home assignment and an hour to review the outcomes.

Background

We all use water in various means every single day - life without water would not just be inconvenient, it would be impossible. Despite water's role as the most important resource, it is often unavailable in many areas of the world and is squandered away in places where it exists. Water's distribution -especially fresh or potable water- is very uneven across our planet, and even within each country. The issues associated with access to water are complex and varied. Because of its importance in all aspects of life on Earth, water should be regarded as a precious resource and conservation efforts should be a priority.

How to do it

1. Explain to your group that they will be doing a ***Personal Water Audit*** which will give them insight into their own daily water usage, and will be an indication of how much water is used on a daily basis. Tell them to complete the audit as a home assignment and to bring it to the next meeting.
2. In the next meeting, begin by listing the water usage totals of each participant (as calculated in their Personal Water Audit pre-assignment) on the whiteboard. Honoring those who used the least amount of water is a great way to encourage others to start saving water!
3. Guide your group in determining the class average of daily water usage (personal domestic use and total daily water use).
4. Then, lead a discussion of the Personal Water Audit results, water use, and availability. Use the following questions as a guide:
    a) Were you surprised by your daily personal water usage? Did you imagine that you used more or less water each day? How does your personal total differ from the class average?
    b) How much of your total water was actually used and how much was wasted down the drain?
    c) How much more water do you use than what actually comes from the faucet? How do you think this water is used? (Remind the participants that a large majority of water is used in agriculture and industry. For example, it takes close to 9 500 litres of water to make a pound of beef and 2 660 litres to make a cotton shirt, and nearly all of their food and drink required water to process. In addition, almost every product they use required water to make, transport, etc.)
    d) What factors affect the totals calculated today?
    e) How would your audit look if you did it on a weekday vs. a weekend day?
    f) What about summer vs. winter? (Ask them to think about playing with a sprinkler or filling a pool, watering a garden or yard, etc.)
    g) How do you think your water usage compares to other people in your country? (Consider urban vs. rural people, **poverty** levels, etc.)
    h) How do you think your water usage compares to people in other countries?

(Consider **climate**, cost, availability, access, etc.)

i) Conditions such as **drought**, **pollution**, rising population, and unequal distribution of **natural resources** threaten our water supply. What might happen if we were faced with extreme water shortages? (Cost would go up, our usage would have to go down, access would be less reliable, conservation practices would become more common, etc.)

5. Finally, ask each participant to write a brief newsletter for their parents reporting on the results of their audits. With the help of their family members, ask them to figure out ways to conserve water at home! In a next meeting, you can have each participant share the solutions they came up with.

Discussion

What changes would you have to make if you and your family did not have running water at home?

How catastrophic would it be if clean, **accessible freshwater** was no longer available to us and to other living things?

How can humans guarantee there will be enough water for them and for other living **organisms** in the future?

Source: Earth Day Network, Water: An Amazing and Precious Resource, http://edu.earthday.org/sites/default/files/An%20Amazing%20and%20Precious%20Resource%209-12_Lesson%20Plan.pdf

Personal Water Audit

Name: _____ Date: _____

Answer the following questions about your water usage today. If you do not know the exact numbers, please estimate as well as you can.

Pre-Question: Before completing the chart below, take a guess at how many litres of water you use in one day ___ Compare your guess with totals below when you finish your water audit and calculations!

Question	Answer	Calculation – try not to use a calculator!	Answer
1. How many times today have you flushed your toilet?		Multiply this number by Three. The average toilet uses 11.4 litres of water per flush.	L
2. Did you take a shower or bath?		Write down 150 litres if you took a bath. Write down 30 litres for every minute you were in the shower. You may adjust your number if you did not fill the tub all the way or if you have a low-flow showerhead.	L
3. How many times did your family run the dishwasher today?		Account for about 40 litres per load.	L
4. How many loads of laundry did your family do today?		Multiply this number by 150. (If you have a front-loading washer, multiply by 90 per load).	L
5. How many minutes today did you run your sink faucet? Think about			L

brushing teeth, washing hands and face, washing dishes, shaving, etc.		Factor 15 litres per minute.	
6. Check the faucets in your house to see if any are leaky. Count the number of drips per minute.		For every ten drips in a minute, multiply by 5. This should be done for each leaky faucet.	L
7. How many glasses of water did you drink today?		Multiply each glass by 0.25. There are about 250ml in an average glass. 1 000ml = 1 litre (or about 4 glasses of water).	L
8. Did you use a hose today? Think about watering a garden, washing a car, or bathing a pet.		Factor 40 litres per minute.	L
Daily Total		*Add up the numbers in the right-hand column. This is how many litres of water you used today domestically.*	L

This is ***your personal daily domestic water usage***. Remember that this does not include the general water used to run your household, school, car, or other shared space. In addition, water is used to produce almost everything you buy, eat or drink!

Multiply your daily water usage by 30 to find your average monthly water usage in litres: _____
Multiply your monthly water usage by 12 to find your average yearly water usage in litres: _____

Compare this to your original guess at the top. Are you surprised?

Save Water!

Level 1 2 3

Aim

To realize how simple it is to practice water conservation.

Materials

An outdoor setting, four large buckets, water, two measuring cups, two meter sticks, two containers (for tickets), water spending tickets, paper, markers, adhesive tape.

Time

30 minutes.

How to do it

1. Take your group to an outdoor setting and explain to them they are playing a water conservation game.
2. Label two buckets with ***Colossal Water Consumers*** and the two others with ***Smart Water Spenders***. Out of each pair, designate one bucket as ***'Clean Water Supply'*** and the other as '***Water Spent***'.
3. Fill one of each pair of buckets with 6 litres of water and place them at one end of the activity area. Put the water spending tickets in the containers, and place them next to their respective teams.

4. Divide your group into two teams and give each one a measuring cup; indicate to them that they will be participating in a relay race that will show both efficient and non-efficient uses of water.
5. Explain the instructions: one team member from each team must move up to the ticket basket, take a ticket, and follow the instructions. Each team member will go to his/her respective bucket, Colossal Water Consumers or Smart Water Spenders, and with his/her measuring cup, withdraw the amount of water indicated on his/her ticket from the Clean Water Supply bucket, and pour it into the Water Spent bucket. They must return to tag the next member in their team, pass on the measuring cup and have a seat for the game to continue. The team to go through all their water uses (tickets) wins.
6. Compare the amount of water spent and conserved in the Water Conservers and the Water Wasters buckets by having participants either measure water height (using the meter sticks) or water volume. The participants can create a chart or graph to visually compare the various types of water use between the Colossal Consumers and the Smart Spenders using the information on the water tickets.

Discussion

How different was the water use between the two teams? Would you say you are a 'water conserver' or a 'water waster'?
Which activities spend more water?
Can you think of any other ideas that might help you to conserve water?

Source: $H_2OH!$, Activities, Bringing Water Home, Saving Water: What a Difference it Makes!, www.watercan.com/h2oh/3-3.shtml

Water Spending Tickets

Colossal Water Consumers	Smart Water Savers
We flush different items down the toilet such as bugs or toilet paper. 250 mL	We never flush extra items down the toilet. We have also installed a low flush toilet. 125mL
We take long showers and leave the water running before showering. 500mL	We take very quick showers. 125mL
We leave the water running while brushing our teeth. 250mL	We shut the tap off while brushing our teeth, and use a glass of water for rinsing. 125mL

Colossal Water Consumers	Smart Water Savers
We water our grass everyday in the summer, and often leave the hose running. 300mL	Our grass does not need watering everyday in the summer, and we use a sprinkler on a timer. We also have plants that require little water, and use collected rain water to water our plants. 100 mL
We take long hot baths and fill the tub up to the top. 350mL	We usually take short showers, and do not completely fill the tub if we need to take a bath. 125mL
We drink cold water from the tap and let the water run while doing so. 250mL	We keep cold water available in the fridge to drink and avoid running the tap constantly. 125mL
We wash even small loads in the washing machine, and do not adjust the water levels. 500mL	We use the washing machine mainly for full loads and/or adjust the water levels. 250mL
We ignore dripping faucets. 500mL	We close dripping faucets properly and fix leaking ones immediately. 0mL
We wash our hands while letting the tap run. 250mL	We close the tap while soaping our hands, and do not let the tap run. 125mL
We wash even small amounts of dishes using the dishwasher. 500mL	We only use the dishwasher when there is a full load of dishes to wash, and we have a water-saving dishwasher. 250mL
We wash our car using a hose and liquid soap. 500mL	We wash the car with a sponge and a bucket of water. 200mL
We have showerheads which leak, and which allow water to flow from the tub faucet as well. 500mL	We use low flow showerheads that save water when showering. 125mL

Colossal Water Consumers	Smart Water Savers
We leave the faucet running when washing our dishes. 325mL	We fill the sink when washing our dishes. 250mL

Water, Agriculture & the Food We Eat

Level 1 2 3

Aim

To understand the role of water in agriculture, as well as the challenges it entails.

Materials

A field trip to a farm (if it is not possible you could ask a farmer or a specialist to come visit your group), notebooks, pencils, photo camera (optional)

Time

Two to three hours.

Background

Agriculture accounts for around 70 percent of water used in the world today, and it is also the major user of water in most countries. Agriculture also faces the enormous challenge of producing almost 50 percent more food by 2030. Water plays a critical role in growing crops and raising livestock to feed a hungry and growing world. However, farming also contributes to water **pollution** from excess **nutrients**, pesticides and other pollutants. Therefore, sustainable management of water in agriculture is critical to increase agricultural production, ensure water can be shared with other users and maintain the environmental and social benefits of water systems.

How to do it

1. Explain to your group that you are visiting a farm in order to understand the relationship between water use, agriculture and food production. It is a good idea to have a previous discussion with your group about the doubts they might have and to help them prepare some questions. Here are some ideas:
   - Would you describe yourself as a land and water manager? Why?
   - How have water and agriculture changed throughout time? Has its role of feeding the world also changed or evolved?
   - How would you describe the water's role in agriculture 'from field to fork'?
   - Why is it important to encourage sustainable use and management of water in agriculture?
   - What are the main challenges that agriculture imposes to water?
   - How essential is it to satisfy plant and animal water needs taking into account the 4R's -right amount, right quality, right time and right cost?
   - How does technology help agriculture meet its water needs? And how does technology help farmers protect water resources?
   - What is the future of water in agriculture and its relationship to **food security**?
2. During the visit, encourage your group to pay good attention and to take notes! If it is

possible, you can also take some photos.

3. It would also be nice to talk to the farmer so your group can participate in some farming activities, maybe giving water to the animals, washing farming materials in an adequate place, irrigating plants, etc.

   * *The older groups can also make a research about agricultural policy and how it is facing the challenge of addressing water quality issues such as reducing water pollution, while providing benefits such as maintaining aquatic life. It would be a good idea to have them present an essay.*

Discussion

What was the most interesting fact you learnt during the visit?
Why is it necessary to encourage sustainable water use practices? How does this influence water quality and availability in the future?
How can you contribute to protect water through your food choices?

Useful Fisheries

Level 2 3

Aim

To explore the many benefits human beings receive from fisheries.

Materials

Whiteboard, whiteboard markers, colouring pencils, colour markers, magazines, newspapers, poster board, glue, aquatic food labels (brought in by the participants or by you).

Time

One hour.

How to do it

1. Begin by asking the participants who likes to eat fish, lobster or shrimp, different types of food that come from the water. When was the last time they had fish or seafood for dinner?
2. Discuss with your group where aquatic food comes from and the many types of food we obtain from water, which give people many different benefits.
3. When the discussion is over, tell them all of these places are fisheries. Ask the participants to discuss what they think a fishery is. Use the following information to explain there are three interacting components that make up a fishery:
   - *Habitat* - the **environment** including both living and nonliving components in which the **organism** lives.
   - *Biota* - the living **organisms** in an **ecosystem** including fishes, plankton, aquatic insects, birds, and mammals.
   - *People* - users of the fishery and competitors for water from the fisheries.
4. A fishery can be found in both salt and fresh waters. Have students discuss how these three components interact with each other:

   Organisms < > Habitat < > People

5. Using the food labels, ask your group to help you classify the aquatic food products according to the kinds of aquatic **habitats** in which they are found: saltwater (ocean, estuary, marsh) and **freshwater** (lake, pond, river, stream).
6. Participants know we use fisheries for food (70 percent of harvest is consumed by people), ask them what other things we use them for:
   - Employment: 200 million jobs depend on the fishing industry worldwide
   - Decoration and jewelry: shells, pearls, corals, mollusks
   - Personal **hygiene**: sponges
   - Pet feeds: fish products for cat and dog foods, cuttlebones for birds
   - Thickening agents from seaweed: agar, paints
   - Pets: fish, turtles
   - Environmental indicators
   - Research: science and medicine
   - Recreation: sport fishing
   - Aesthetic value
7. Next, ask the participants to use newspapers and magazines to cut out images of all the foods derived from aquatic **environments**, as well as different uses people give to fisheries.
8. Have your group construct a mural or a bulletin board about our *Useful Fisheries*!

Discussion

How do you use a fishery? Are you surprised at some of the uses of a fishery?
What environmental requirements must be met to sustain a fishery? What would happen if water sources where contaminated?
Who is responsible for protecting these water sources? What can you do?

Adapted from: College of Agricultural sciences, Water Lesson Plans, Management of Commercial Fisheries, http://ecosystems.psu.edu/youth/sftrc/lesson-plan-pdfs/part1-appendix

Water All Around!

Level 1 2

Aim

To realize how much water is in the news and why.

Materials

Newspapers, magazines, notebook, pencils, colouring pencils, scissors.

Time

One 15 minutes lesson (to explain the activity) and one 40 minutes lesson (to review the outcomes).

How to do it

1. Explain to the participants that they are going to make their own water scrapbook, so they can always remember why water is so important to human beings. The participants can do this as homework or during the meeting.
2. Ask them to look for water related articles and photographs on newspapers and magazines. These must be related to water availability and uses of water.

Ask your group to do this for at least a week.

3. Have each participant present their scrapbook to the rest of the group.

Discussion

Which was your favorite article? Why?
Where there some common heads? What were they about?
Why do you think water is always in the news?

Water Use Crossword

Level 1 2 3

Aim

To discover some facts about water use.

Materials

Copies of the Water Use Crossword Puzzle, pencils.

Time

30 minutes.

Background

We consume more water than we can imagine. Water is hidden in everything we see around us: our clothes, our food, our cell phones. 'Embedded water' is simply the water used to produce a good. Every product uses water at some point during its manufacturing process; some goods are very water intensive and others not so much. You might be surprised at how much water it takes to bring a hamburger to your plate, approximately 2 400 litres! This happens because water is first used to grow crops which are then fed to animals that also drink water. Water is also used to service livestock. Therefore, meat and dairy products have higher embedded water contents than most crop products. As **water cycles** up the production chain, more becomes embedded in our food.

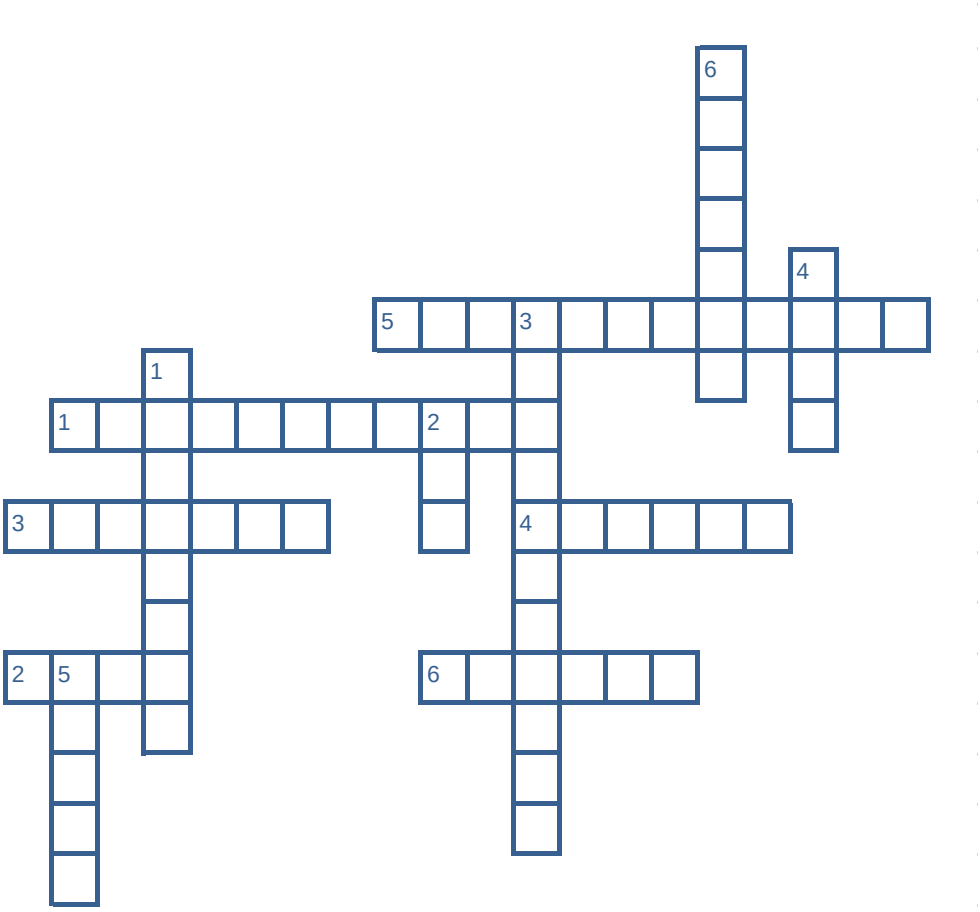
How to do it

1. Explain to your group that they are going to solve a **Water Use Crossword Puzzle**, which contains many interesting facts about water use.
2. Hand a copy of the crossword to each participant and give them enough time to solve it (the younger groups can work in couples).
3. Check the answers with the entire group.

Discussion

Did you know there was a 'hidden water' in everything you use? What do you think about that?
How can being a smart consumer help reduce water use?
Whose responsibility is it to protect water quality and availability?

Water Use Crossword Puzzle



Across

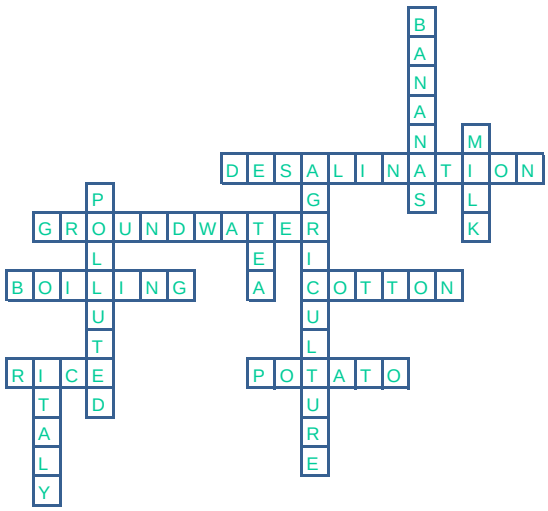
1. Drinking water can come from **surface water** and from _____, which can be withdrawn from the ground using a well.
2. _____ is the world's most popular food. 2 497 litres of water are needed to produce one kg of this small grain, which is also used to prepare sushi.
3. This is a method that can sanitize or clean water for drinking: _____. When water reaches this temperature it starts to turn into a gas.
4. The fibres of this plant are used to make cloth. 2 495 litres are needed to produce a _____ shirt of 250 grams.
5. _____ is a process which removes salts from ocean water to make it drinkable, and it produces some 60 billion litres of water every day.
6. This round vegetable grows underground and has white flesh with light brown, red or pink skin. 287 litres of water are needed to produce one kg of this food, which you can enjoy boiled, roasted, mashed or fried.

Down

1. When **freshwater** is _____ it is unsafe for drinking and people can get sick.
2. This is Britain's favourite drink, and it takes 27 litres of water to produce a 250ml cup: _____.
3. Globally, around 70 percent of water is used for_____, that is for the production of the food we eat.
4. 255 litres of water are needed to produce one 250 ml glass of _____, the white liquid produced by cows, goats, and sheep and used by humans as a drink or for making butter, cheese or yogurt.
5. A country from Europe, famous for its pizza,_____, is the one that consumes the highest amount of bottled water per person in the world.
6. 790 litres of water are needed to produce one kg of _____, monkeys' favourite fruit.

Source: Water Footprint Network, product Galley,
www.waterfootprint.org/?page=files/productgallery

Answer:



The Key Water Indicator Portal

Level 2 3

Aim

To discover a useful tool that displays statistics on water resources and uses.

Materials

Internet access, pencils, paper.

Time

One hour.

Background

Water is life. For millions of years life on Earth has been dependant on water resources for survival. 70 percent of the Earth's surface is covered by water, but of this, approximately 97.5 percent is salt water, and only the remaining 2.5 percent is **freshwater**. Of this 2.5 percent, less than 1 percent is available for Earth creatures to use, whilst the rest is in the form of ice at the poles. The amount of water on Earth is constant and cannot be increased or decreased, but it is unevenly distributed across the planet. Different countries around the world possess different amounts of water resources and receive different annual rainfalls due to the nature of the **weather** conditions. Therefore, water use and availability around the planet may vary greatly.

How to do it

1. Explain to your group that **The Key Water Indicator Portal (KWIP)** was developed by UN-Water in order to provide up-to-date and valuable information about water indicators that can be useful to reporters, policy makers, researchers, and the general public alike.
2. Divide the participants into small groups and ask them to explore the KWIP webpage:
   - www.unwater.org/statistics_KWIP.html

   Maybe they could find some worldwide information about the percentage of **freshwater** resources withdrawn or they could be more specific and find out the sectoral withdrawals within a country.

3. Next, have each group make a small presentation about their findings. What

interesting facts did they learn?

Discussion

Why is it important to have up-to-date facts and information about water use?
How does this information help you realize about the need to use water wisely?
What can you do to help promote everyone's right to access clean and sufficient water?

Water Treatment

Level 1 2 3

Aim

To learn how water comes into and leaves homes and businesses.

Materials

Notebooks, pencils.

Time

A ten minutes session to explain the activity and to prepare some questions for the local water department representative's visit, and an hour session to receive him or her.

Background

Rivers and lakes are sources of water for local areas. Water samples collected from these water sources often look cloudy. Samples can look clear and still contain invisible sources of **pollution**. Rivers and lakes must be monitored for contamination and other sources of **pollution**.

Water that enters the local water supply has to be cleaned before it can be used and must also be cleaned after it is used. Thus, the water is both pre-cleaned and post-cleaned. Pre-cleaning takes place at a water treatment plant, and post-cleaning takes place at a **wastewater** treatment plant. In some areas of a country, raw or insufficiently treated **wastewater** threatens the purity of the water resources. Poorly treated **wastewater** may contain harmful levels of bacteria and chemicals that can jeopardize human life. Local water systems are responsible for cleaning the water before it is used. The water treatment system includes different steps for the treatment of the water before it is allowed to enter the homes of individual citizens.

The following steps are included in a water treatment **filtration** system:

1. Screening removes large objects from the water.
2. Pre-chlorination adds chlorine to kill disease causing **organisms**.
3. Flocculation adds alum and lime to remove suspended particles by trapping them in a jelly-like suspension formed from the added particles.
4. Settling allows trapped particles and solids to settle to the bottom.
5. Sand **filtration** allows sand to act as a natural filter, removing nearly all suspended material.
6. Post-chlorination adjusts the chlorine to maintain long-term action to kill disease-causing **organisms**.
7. Other treatments, such as fluoridation, pH adjustment, and further aeration, can be optional steps.

The following steps are included in a **wastewater** treatment system:

1. Preliminary Treatment: screening is when large objects are removed; smaller objects are ground into even smaller pieces, and sand and dirt are allowed to settle out.
2. Primary Treatment: primary settling happens when floating grease and scum are skimmed and heavier organic solids settle out.
3. Secondary Treatment: aeration tanks add air and allow bacteria to digest organic substances. Sometimes rock or plastic media filters are used to grow bacteria that consume **organisms** in the **wastewater**.
4. Final settling is when bacteria settle out of the **wastewater** and are removed to a solids treatment process for stabilization. The stabilized solids, called biosolids, are then suitable for disposal on cropland, in landfills, or for other beneficial uses, such as compost.
5. Disinfection or chlorination means that additional chlorine is added to kill disease-causing **organisms**. Chlorine can be harmful to humans in large amounts. Chlorine can react with water and produce harmful substances such as chloroform which is carcinogenic. Other popular means of disinfection include ultraviolet irradiation that uses ultraviolet rays to kill harmful bacteria.
6. Optional treatments include controlling water pH by using carbon dioxide to form carbonic acid. Carbonic acid can neutralize alkaline compounds. Heavy metal ions and phosphate ions can also be removed by **precipitation**.
7. Advanced treatment processes also remove toxins such as ammonia.

Source: United States Environmental Protection Agency, The Water Sourcebooks, Purification of Water, http://water.epa.gov/learn/kids/drinkingwater/upload/The-Water-Sourcebooks-Grade-Level-6-8.pdf

How to do it

1. Invite a representative from your local water department to your school or youth group, so he or she can explain how water is distributed to the community and how it is treated once it has been used.
2. Before that day, make sure you encourage your group to think about the things they might want to know and help them prepare some questions.

Discussion

What might happen if any of the steps involved in the purification of a municipal water supply was not included?

Does everyone in your community have access to clean and readily available water? What happens with the people that do not have access to sufficient and good quality water?

Does everyone have to participate in the protection of our water resources? What are some things you can do at home?

A Water Drop Adventure

Level 1 2

Aim

To understand how the **water cycle** and water use are correlated.

Materials

Paper, pencils, colouring pencils, colour markers.

Time

One hour.

Background

The water we find in our world is always being recycled through our **environment**. It constantly moves through air, animals, plants and soil. This movement of water is called the **water cycle**. It all starts when water from rivers, lakes, ponds, or oceans is warmed by the sun and transforms into water vapor, through a process called **evaporation**. This vapor rises into the **atmosphere** where it cools and changes back into tiny water droplets, through the process of **condensation**. Clouds form when the water vapor condenses in the air. As more water vapor cools into the clouds, the water droplets become larger every time. When the droplets are big enough, they drop down to the ground as rain, or **precipitation**. Rain can either soak into the ground (through a process called infiltration) and become **groundwater**, or it can run off the land and drain into rivers, lakes and streams (runoff). Plants and animals are also involved in the **water cycle**. Plants lose water out of their leaves through the process of **transpiration**, when the sun shines these tiny droplets of water are transformed into vapor. Animals, on the other hand, lose water through sweat, a process called **perspiration**, which is also evaporated by the sun's heat.

How to do it

1. Remind your group about the **water cycle** and also about the ways water reaches their homes so they can use it for their everyday activities. How are these two concepts related? How does the **water cycle** help clean the water we use?
2. Divide the participants into small groups. Explain that they will create a **'Water Drop Adventure'** story that shows their own ideas about what a good travel adventure for a water drop might be. Make sure the participants show how the water gets from one place to another and in which phases (liquid, gas, solid). For example, they might start their story when it begins to rain, or they might prefer to start when they open their water faucet at home, the possibilities are endless, tell them to be creative and to have fun! Ask them to include a drawing of their water droplet.
3. Have each group read their story.

Discussion

Which was your favorite story? Why?
What would happen if the **water cycle** didn't exist?
How can we make it easier for our **environment** to clean our water?

Your Water Footprint

Level 1 2 3

Aim

To understand what the **water footprint** is.

Materials

Internet access.

Time

One hour.

Background

Why bothering about your **water footprint**? The **water footprint** provides an indicator of both direct and indirect **freshwater** use. The focus on **freshwater** is important because it is **scarce**; its annual availability is limited and demand is growing each day. The **water footprint** of humanity has exceeded sustainable levels at several places and is unequally distributed among people. There are many spots in the world where serious water depletion or **pollution** takes place: rivers running dry, dropping lake and **groundwater** levels and endangered species because of contaminated water. The **water footprint** refers to the volumes of water consumption and **pollution** that are 'behind' your daily consumption.

As a consumer, you can reduce your 'direct **water footprint**' (home water use) by installing water saving toilets, applying a water-saving showerhead, closing the tap during teeth brushing or using less water in the garden. Your 'indirect **water footprint**' -the water consumption and **pollution** behind all the goods you buy- is much larger than your direct **water footprint**. You have basically two options to reduce your indirect **water footprint**. One option is to substitute a consumer product that has a large **water footprint** by a different type of product that has a smaller footprint. For example: eat less meat or eat soya meat, drink tea instead of coffee, or even better, drink plain water. And replacing cotton clothes by clothes from artificial fiber saves a lot of water too.

But this approach has limitations, because you may find it difficult to drastically change your consumption patterns. However, you still have other options: you can select the cotton, beef or coffee that has a relatively low **water footprint** or that has its footprint in an area that doesn't have high **water scarcity**. Nevertheless, this requires that retailers provide you with proper information to make such choices.

How to do it

1. Explain to your group what the **water footprint** is and tell them that each one will use an online calculator to discover their own **water footprint**.
2. Have each participant calculate his or her **water footprint** using the *Water Footprint Network* calculator (for the younger participants, you can calculate a **water footprint** for all the group):

   - *Your Water Footprint:* www.waterfootprint.org/?page=files/YourWaterFootprint

     It is a good idea to check the calculator questions before the day of the class or meeting, so you can tell the participants if they need to obtain some information from their parents in order to successfully complete the **water footprint** calculator.

3. Ask your group to make small teams and tell them to compare and discuss about their

results. Finally, you can have a group discussion about the topic.

Discussion

How does a calculator, like the one you used today, help you realize about your responsibility to protect our **natural resources**?
Now that you know what the **water footprint** is, do you think you need to make some changes regarding your water use?
In which activity do you spend more water? Can you do something about that?

Water Wise Inventions

Level 2 3

Aim

To realize how new inventions and technology can help save and conserve water.

Materials

Internet access, computer with access to computer programs (if it is not possible you can use poster boards).

Time

One hour to prepare the presentations and an hour to have each team present their work.

Background

During the past 50 years water use has increased for food, goods and energy production to meet the demands of a growing population and to enhance human wellbeing, a continuing global trend. However, the changes in the way water is used have significant adverse impacts, which require urgent attention to ensure sustainability.

According to UN-Water, by 2025, 1.8 billion people (23 percent of the total expected population) will be living in countries or regions with absolute **water scarcity**, and two-thirds of the world's population (another 3.4 billion people) could be living under conditions of **water stress**. This will really challenge human's ability to meet the water requirements for agriculture, industry, domestic purposes, energy and the **environment**. For this reason, concern about the consumption and availability of water is growing all around the world. According to experts, there is enough water in the world but it must be managed better. Therefore, people all over the planet are working on water-saving inventions that can make a big impact on water conservation.

How to do it

1. Remind your group how scientists and inventors work on the creation of innovative products that can make a contribution to human beings, maybe by making life easier or by helping people to use things in a more efficient way. How can inventors help conserve water?
2. Divide your group into small teams and explain that each one will have to look for a cool invention that was thought to save and/or conserve water. Here are some useful and interesting links:
   - *Halogen.tv*
     http://halogentv.com/articles/4-really-cool-water-inventions
   - *Smart Planet*

www.smartplanet.com/blog/thinking-tech/invention-uses-sunlight-to-produce-clean-water/6620

- *POPSCI*
  www.popsci.com/diy/article/2012-05/2012-invention-awards-recirculating-shower
- *XEROS*
  www.xeroscleaning.com

3. Give the teams enough time to prepare themselves and ask them to be creative when making their presentations.
4. Have each group present its work!

Discussion

Which do you think was the cleverest invention? Why?
Can you think of other invention that could help us use water in a better way?
Why are people every time more concerned about water use and conservation?

Useful resources

DC Water for Kids
www.dcwater.com/kids/index.html

Eco Friendly Kids
www.ecofriendlykids.co.uk

H_2O Use Water Saver Home
www.h2ouse.org/index.cfm

Project Wet Worldwide Water Education
projectwet.org

United States Environmental Protection Agency - Students
www2.epa.gov/learn-issues/water

Ocean Link
http://oceanlink.info/index.html

Water Use It Wisely
www.wateruseitwisely.com

Water at Risk

Introduction

We already know that our world has all the water that it will ever have; therefore, we can better understand why it is so important to keep it clean. The **freshwater** people, animals and plants need to use every day must be clean and safe to ensure their well-being. And to this end, nature is very accommodating. The water that circulates between the earth and the **atmosphere** is continuously restored and recycled thanks to the **water cycle**. So, why all the worries? The problem is that humans are interfering with this system as we are using and polluting water at a rate that exceeds nature's natural restorative capabilities.

It is clear that the pressures affecting our planet's water systems are related to human development and economic growth. Because of human activity, rivers, lakes, **aquifers** and other water bodies have dried up in many areas. Both surface and **groundwater** resources are being depleted and polluted to an extent never before witnessed. Moreover, water is not evenly distributed around the world, so some places have more than they need, and others have too little. Nature can also stir up some environmental problems as a result of natural events such as earthquakes, volcanic eruptions and hurricanes.

Many people and communities all around the globe are increasingly suffering because of insufficient and unsafe water. Being aware of the major causes that have provoked this situation -population growth, **urbanization**, **pollution**, **climate change** and poor management- can encourage children and youth to translate their knowledge into advocacy and action. Young hands are capable preserving water, preventing its **pollution** and promoting water access for all.

Activities

Water Pollution Collage

Level 1 2 3

Aim

To identify sources of water **pollution**.

Materials

Poster board, colour markers, colouring pencils, newspapers, magazines, scissors, glue.

Time

40 minutes.

Background

Water **pollution** is the contamination of water bodies, such as lakes, rivers, oceans, **aquifers** and **groundwater**, very often by human activities. Water **pollution** occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds or substances.

Water covers over 70 percent of the Earth's surface. It is a very important resource for people and the **environment**. Water **pollution** affects drinking water, rivers, lakes and oceans all around the world. Any change or modification in the physical, chemical and biological properties of water can have a negative consequence on all living things.

How to do it

1. Start by reminding your group what a **watershed** is: *all the area of land that sends rainwater or melting snow or ice into a common body of water, such as a river, a stream, a lake or the ocean.*
2. To further explain this concept, have students imagine: *if a huge giant were to pour an imaginary pitcher of water over your landscape, how would the water flow? What areas would it run over and where would it drain?*
3. Encourage your group to think about what their **watershed** might include? Does the water in your area come from glacial melting? Rainfall? Rivers? Streams?
4. Next, ask the participants to help you define what **pollution** is, and consider the following causes of water **pollution**:
   - **Sewage** and **wastewater**
   - Septic tanks
   - Ocean and marine dumping
   - Industrial waste (industrial **pollution** can come from: asbestos, nitrates and phosphates, lead and mercury, sulphur, oils)
   - Oil **pollution** (from routine shipping, **run-offs** and dumping of oils on the ocean surfaces)
   - Underground storage and tube leakages
   - Atmospheric deposition (**pollution** of water bodies caused by air **pollution** - **acid rain**)
5. Ask your group the following questions: What other people, animals, towns, industries, farms, etc. might share your water source? How might each of these contribute to the **pollution** of the **watershed**? Remember, water runs from higher

elevation to lower (upstream to downstream). Where does your **watershed** start?

6. Divide the participants into two groups and ask each one to make a ***Water Pollution Collage.*** Have students draw the water source near their school or meeting group. Using magazine pictures or drawing, have them add the things that might be in the water. Tell them to think about plants and wildlife, human uses (boating, fishing, etc.), and nearby sources of **pollution** (houses, roadways, factories, farms, landfills, runoff, litter, etc.). Explain that it does not need to be drawn to scale, and that they should also think of tiny or invisible things in the water (bacteria, oil, chemicals, etc.). Encourage creativity!
7. Have the groups share and discuss their collages.

Discussion

Why does **pollution** negatively affect our **environment**? What are some of the consequences?
How do you think your neighborhood is contributing to water **pollution**?
How could polluted water affect your life and your everyday activities?

Adapted from: Earthday Network, Filtering Water, Water Pollution Collage, http://eeweek.org/assets/files/EDN%20Water%20Lessons/Filtering_Water_5-8.pdf

Dirty Sediment

Level 1 2 3

Aim

To explore how sedimentation can affect water bodies.

Materials

Big pan (metal or plastic), rocks (big and small), aluminum foil, water, salt sprinkler filled with cocoa.

Time

40 minutes.

Background

A **watershed** is all the area of land that sends rain into a common body of water, such as a river, a stream, a lake or the ocean. A **watershed** can be as small as the water draining into a puddle in the back yard or as big as the Pacific Ocean **watershed** in the United States. As humans, animals and plants live together in this area they depend on each other to survive, but human activities can have negative or positive effects upon the **environment**. Therefore, it is essential to reflect about water quality and the need to protect and better manage the land that forms a **watershed**.

How to do it

1. Explain to your group that you are going to create a **watershed** model in order to understand how the bodies of water can be affected by different situations that occur on the **watershed** land.
2. Ask the participants to use the pan to create the **watershed** model. Tell them to make some hills and mountains using the rocks and the aluminum foil, they can simulate two parallel mountain ranges. Have them cover the entire pan with the aluminum foil to represent the land. It should be molded so that some parts are flat while other

parts have bumps and uneven parts. The foil should slope downward so that there is an area at the end of the pan where water can collect.

3. Tell a participant to sprinkle a substantial amount of cocoa on one of the hillsides the group created. Explain that this is where an avalanche occurred, scraping away all the trees and other plants and leaving only loose topsoil.
4. Have a participant pour some water over the cocoa so that your group can watch the flow. Explain that when soil is carried over the surface of the earth by water, it is called erosion.
5. Ask your group, what happens when this soil ends up in streams, rivers and other water bodies? This is called sediment. This soil is floating around in the water and sinking to the bottom. Sediment becomes a problem in the streams, rivers, and oceans because it is not supposed to be there. A big amount of sediment enters water bodies after heavy rainstorms, especially when loose soil is left exposed to the rain. Why is sediment a problem? Here are some ideas:
   - It is a form of **non-point source pollution** that is difficult to control on a societal level.
   - It makes the water muddy looking and blocks out the light that water plants need to grow. Water plants make oxygen for the water animals to breathe. Without water plants, many water animals also have nothing to eat.
   - Sediment gets clogged up in the gills of fish so they cannot breathe. This would be like human beings trying to breathe in the middle of a dust storm.
   - Fish eggs need to have clean, clear water flowing over them in order to grow and hatch. Water with sediment will smother and kill the eggs. Eventually there will be no more fish.

Discussion

How can sediment affect other creatures that form part of the **watershed**?
How does protecting and better managing the land that forms a **watershed** help to protect the water bodies?
Is there any specific problem in your **watershed** that needs attention? What can you do to help solve it?

Adapted from: College of Agricultural Sciences, Water Lesson Plans, To Protect Your Steams, Protect Your Mountains, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water/k-5/protect

Where Does Water Go?

Level 1 2

Aim

To learn how daily actions can help or harm a body of water.

Materials

Poster board, colour markers, colouring pencils, bottle caps (to use as counters), coin, 30 small pebbles or beans.

Time

40 minutes to prepare the game board and other 20 minutes to play the game.

Background

Water comes into our cities from a source, and we access it through different distribution systems such as faucets, wells, trucks and bottles. We then use water for all of our needs

like bathing, cooking, cleaning, drinking and toilets. But where does the water go after it disappears down the drain? When disposed of properly, the water we use runs through pipes to **wastewater** management systems where it is cleaned before it reenters natural water systems such as rivers, lakes and oceans. The water we use is cleaned and reused by others who live downstream. Because of this, it is important to dispose of **wastewater** and potential water pollutants properly.

How to do it

1. Explain to your group that you are going to play the **Where Does Water Go?** game, but that first they must help you design it.
2. Draw a curvy and long river on the poster board and have the participants draw seven big fishes all along the river, make sure one is located at the beginning of the river and other at the end.
3. Write 'Start' in the first fish, number the following five fishes from '1' to '5', and write 'Finish' in the last fish.
4. Next, explain that each station (from one to five) will have two instructions, one located at the right side of the fish and the other located at the left side of it. Ask the participants to help you write the instructions as follow:

Station 1

1A: You threw your trash in the trash can so it wouldn't wash down a drain or into the river. Remove one bean from the river.

1B: A city bus leaked oil onto the road and the oil was washed into the river. Add one bean to the river.

Station 2

2A: You poured your leftover paint down a drain leading to the river. Add two beans to the river.

2B: You picked up garbage from the street and disposed of it properly so it wouldn't wash into the river. Remove one bean from the river.

Station 3

3A: You sent your used oil to be disposed of at a hazardous disposal site. Remove two beans from the river.

3B: You picked up after your pet and disposed of the waste in a garbage can. Remove two beans from the river.

Station 4

4A: The **sewage** pipe from your apartment building was not hooked up properly and leaked **sewage** into the street and river. Add two beans to the river.

4B: You recycled your paper, plastic and cans in the correct recycling bins. Remove two beans from the river.

Station 5

5A: You participated in a community clean-up event. Remove two beans from the river.

5B: You disposed of your sister's dirty diaper in the trash can so it wouldn't pollute the river. Remove one bean from the river.

You can also ask the participants to help you make some cool drawings to represent each instruction!

5. Once the game board is ready, place some 20 beans along the river to represent **pollution**.
6. To play follow this instructions:
   - Give each player a bottle cap and ask them to place their caps at the 'Start' station.
   - The first player starts by moving his or her bottle cap to station 1 and flipping the coin. Depending on the result of the flip, the player follows the instructions from either 1A or 1B. The 'A' instructions will be represented by 'heads' and the 'B' instructions will be represented by 'tails'.
   - The player with the most beans -representing the person who removed or prevented the most **pollution** from going into the river- wins!

Discussion

Why do we need clean and safe water?
How would you feel if the only water available was not as clean? How would that change your life?
Do you think your neighborhood needs to change some negative habits in order to prevent water **pollution**? If yes, how can you help?

Adapted from: Project Wet and UN Habitat, Water and Sanitation in Cities, Where Does Water Go?, www.projectwet.org/pdfs/WASH/Water_and_Sanitation_in_Cities.pdf

Water Obstacle Race

Level 1 2

Aim

To understand how people who do not have access to water struggle to obtain this necessary resource.

Materials

An outdoor setting, different materials might be needed according to your planned activities, here are some ideas: two ladders, newspaper sheets, eight to ten bricks, two jute sacks, two small tires, 15-20 small balls, two fabric bags, two tangerines, two buckets with water.

Time

30 minutes to set the obstacle race and other 30-40 minutes to play.

Background

Less than 1 percent of all the water on the planet can be used by people, the rest is salt water (from the oceans) or is permanently frozen and we can't use it. We use water every

day, but unfortunately water is not easily available in many parts of the world.

In some places even if communities have water pipes and taps, water is supplied only for a few hours a day, in others places people have to store their water supply from the village well, a community tap or hand pump. And still in other cases women and children have to walk various kilometres each day to haul water. About 780 million people lack access to clean water. As the population grows, more and more people need to use this limited resource. Therefore, learning how to care for it is very important.

How to do it

1. Have your students imagine that they have no running water and no water treatment facilities, and that they must collect water from sources near their homes. What might this water look like, taste like, smell like? Would they like to use this water for drinking, cleaning, cooking, etc.?
2. Explain to them that this is the situation of millions of people all over the world. Today around 700 million people in 43 countries suffer from a lack of water. Every day women and children have to walk long distances to collect some water for their families. How would your life change if you had to do that every day?
3. Explain to your group that they are participating in a **Water Obstacle Race** so they can have a small idea of how those people have to gather their own water before being able to use it. The obstacle race will represent the walk poor people have to take in order to obtain this precious resource.
4. You can ask your group to help you organize the obstacle race and maybe they could contribute with some fun ideas. Some six to eight stations are good enough to have a fun obstacle course. Here are some ideas:
   - **Newspaper walk:** provide the participants with two sheets each and explain to them that they need to place one sheet before them and step on it, then place the next sheet in front of them and step on it, and then turn around to lift the previous sheet for the next step.
   - **Ladder run:** a wooden ladder is needed, and it should be painted a bright colour. Lay the ladder flat on the ground and ask the participants to run through its rungs, as quickly as they can.
   - **Brick Hop:** place blocks of bricks at a small distance from each other, such that the participants can hop from one brick to another. Make the course in a zigzag fashion. Let this brick line lead to the next challenge in the obstacle race. If you manage to get wooden blocks, you can place them instead of bricks.
   - **Sack Race:** place a jute sack as the next obstacle course challenge. The participants have to lower themselves inside the sacks, hold the sacks corners and hop till the next challenge.
   - **Stick and Tire:** two small tires are needed. The participants have to place the tire in a vertical position and then using the stick, they have to roll the tire all the way till the next challenge.
   - **Ball Jump Collection:** provide each participant with a small fabric bag (with cloth handles). Place golf balls across the playing ground at equidistant spots in a

line, or in a zigzag pattern. The kids are to squat at the starting line and then jump like a frog towards the golf balls. When they reach the golf ball, they can stand and put the ball into their fabric bag that is hanging onto their wrists. The more the number of golf balls that one can collect, the better.

- **Tangerine Tumble:** place tangerines on the ground, the participants must kneel on the ground and keep their hands behind their back. They are expected to move the tangerine only with their noses till the finishing line.

Game ideas source: Buzzle, Obstacle Course Ideas,
www.buzzle.com/articles/obstacle-course-ideas.html

5. Divide your group into two teams. Explain to the participants that they will be competing against a member of the opposing team. At your call both participants must start the obstacle race and, once they get to the final station and complete the challenge, they must pick the water bucket (make sure it is not too heavy) and run to the starting line without spilling the water. The first one to finish will have one point. The team that gets more point is the winner!
   * The water in the bucket must be a bit dirty, so you can mix it with some dirt.

Make sure you take the necessary safety precautions to avoid anyone from getting hurt!

Discussion

Do you think you could do this every day just to get some water? What activities would you have to give up if you had to spend various hours each day collecting water?
Would you drink the water from the bucket? What would you do if you had no other choice?
What can you do different in your life in order to protect our water resources?

Riparian Rain Check

Level 1 2 3

Aim

To learn about riparian zones that help to maintain a healthy stream **ecosystem**.

Materials

A visit to a stream or river with an established riparian buffer zone (if possible), an outdoor setting, four orange traffic cones, a brown flag for each participant, cardboards, markers, four shoe boxes, 'scenario cards' written on separate pieces of cardboard.

Time

Three hours.

Background

The riparian zone is the land adjacent to a stream or river. A healthy, functioning riparian zone is characterized by a diversity of plants, including trees, understory, and herbaceous species. The presence of a wide riparian zone ensures a vigorous stream **ecosystem** in a number of ways and is the best method known for reducing the threat of **non-point source pollution**.

- The widespread roots of the trees, grasses and other herbaceous plants help to hold

the soil in place, especially along the banks of the stream.

- The leaves and branches of the plants (of all sizes) break the force of falling raindrops, reducing the energy of the moving water. Slower-moving water is less likely to dislodge and carry soil particles into the stream.
- The trees in the riparian zone absorb excessive **nutrients**, such as nitrates and phosphates, which may have been carried with rainwater from farmers' fields or residential lawns. These **nutrients** become bound in the growth of the tree and are held 'in storage' until such time as leaves and branches fall to the ground or into the stream. There, with the help of decomposers, the **nutrients** are slowly released and recycled into the system through the food chain.
- The survival needs for many wildlife species (food, water, shelter and space) are provided in a diverse, well-vegetated riparian zone.

How to do it

1. Explain to your group that you are visiting a stream that has a well-vegetated, wide riparian buffer zone.
2. Have the participants point out examples of healthy riparian zone components: **habitat** for animals; roots on trees that are holding together stream banks; native grasses with deep root systems to absorb runoff, capture erosion, and absorb excessive **nutrients** and other pollutants; trees that are cooling the water by leaning over the stream; trees and other plants that have fallen into the water to provide food for the water creatures, etc. Compare this with an area without a buffer.
3. Ask the participants to imagine the area during a heavy thunderstorm. Then ask the following questions to test and reinforce their knowledge: from which direction would the water come? (uphill) What is the word that describes the land that drains into this stream? (**Watershed**).
4. Set up for the *Riparian Rain Check* game. Place two orange traffic cones approximately 5 metres apart on a playing field (these represent the edge of the stream). Place another two cones about 8 metres apart, located approximately 10 metres down the field from the first set (these represent a construction site with loose topsoil and no erosion control devices).
5. Tell the participants that they are going to become a newly planted riparian buffer zone on a rainy day. Select two participants to be tree seedlings. They will station themselves somewhere near the stream bank, between the two cones. Their job will be to stop the raindrops before they can carry **non-point source pollution** into the stream. The remaining participants will be raindrops carrying sediment toward the stream. Give each of these participants a brown flag to tuck into their clothing and mark them as raindrops/soil particles.
6. The raindrops/soil particles should line up at the construction site. When the leader yells, 'Go!' the raindrops should run toward the stream bank and attempt to cross the line (they must run between the cones). The trees should attempt to tag as many raindrops as possible keeping one foot 'planted' in the ground at all times. When they capture a raindrop, the trees should take the brown flags. Time this 'rainstorm' for ten seconds (adjust time according to the group's age and ability). Yell, 'Stop!' when the time is up.
7. Count and record the number of raindrops that were intercepted by the trees during

the ten second time period. Explain that the **nutrients** carried by the raindrops have been captured by the root systems of the trees, and now these have been used to help the trees to grow and reproduce. The participants who were tagged will now become trees (as the riparian zone grows wider and more vegetated).

8. Repeat the exercise with the additional trees guarding the stream. Count the captured raindrops again. Were there more captures? (More non-point source pollutants can be filtered out by wider and more vegetated riparian buffer zones).
9. Variation: have the trees link arms and stand directly in front of the stream bank to protect it. This simulates the intertwining of roots in the stream bank. The trees may decide to test whether it is more effective to be planted next to the stream or further away. Discuss the results.
10. At the conclusion of the game, explain that the riparian buffer zone has different functions that help maintain a healthy **environment**, for example, to filter out non-point source pollutants such as sediment. The wider and more vegetated the buffer, the more effective it is.
11. Explain to your group that you are playing another game, the ***Riparian Zone Function*** Game. To do so, set up four shoe boxes, labeled with '***Food***', '***Filter***', '***Nutrient Storage***', and '***Habitat***' signs.
12. Divide the group into two equal teams. Give each participant a scenario card, and allow some minutes for the participants to read the cards.
13. Ask the participants to make two lines some 10 metres away from the boxes. At the signal, the first team player in each line will run to the shoebox that is labeled with the riparian zone function that matches the scenario on his or her card. After depositing the card in the appropriate box, they must return to tag the next person in line.
14. After all the cards have been deposited, empty one shoebox at a time, read each card out loud and discuss with the group. If a mistake was made, simply discuss the correct answer, but keep the mistake-maker anonymous.

Discussion

Can you describe ways in which human activity can change the condition of the stream? Be sure that positive (planting riparian buffer zones) as well as detrimental (over fertilizing lawns, disturbing soil and leaving it unprotected) activities are mentioned.
What can you do (or not do) in your everyday life to help protect your streams and rivers?

Adapted from: College of Agricultural Sciences, Water Lesson Plans, To Protect Your Streams, Protect Your Mountains, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water/k-5/protect

Riparian Zone Functions

A maple leaf flutters down into the stream, sinks to the bottom and is eaten by a crayfish.	*A woodpecker finds insects under the bark of a dead tree.*
During a downpour, oil from a parking lot is	*A farmer builds a fence to prevent his cattle*

carried by a rush of water toward the stream, but is slowed down by the bushes next to the water.	from wandering into the stream. The bushes begin to grow again, and the stream becomes less muddy.
A baby trout hides under a fallen log in the stream.	A tent caterpillar colony lives in the branches of a large tree next to the stream.
An oak tree grows large, drops its leaves into the stream, and the fish population increases.	A frog lays eggs in a small pool downstream of a large tree root.
A farmer accidentally doubles the amount of fertilizer on his field. The wildflowers next to the stream grow much taller that year.	Rain falls on a construction site. The runoff is muddy, but the grasses on the stream bank keep the sediment from flowing into the water.
A raccoon goes down to the stream to catch crayfish for dinner.	A drop of rain hits seven leaf surfaces before finally hitting the ground. It is moving much slower now.
A trout leaps out of the water trying to catch a mayfly.	Many species of birds find homes in the riparian forest.

To Point or Not to Point

Level 2 3

Aim

To learn about point and **non-point pollution sources** that can affect water bodies.

Materials

Cardboards, yarn, hole punch, markers, 'pollution cards': write each source of **pollution** on a cardboard; punch holes in the tops of the cards and string yarn through, making the loop long enough to go over the participant's heads.

Time

40 minutes.

Background

Pollution entering a water body can be classified into two categories: point source and non-point source.

- ***Point source pollution*** is easy to identify as it can be traced directly to its source.

  For example, if there is an oil spill caused by an oil tanker, you can 'point' your finger at the exact source of the **pollution**, and the producer of the **pollution** can be notified so that the problem can be corrected.

- ***Non-point source pollution*** is much more difficult to identify because it involves any pollutant that enters the stream by way of surface runoff. Storm water runoff **pollution** is a type of **non-point source pollution**. This means that the **pollution** cannot be traced back to a specific source because it comes from many different sources throughout the **environment**. The pollutant might originate anywhere in the **watershed**, near the stream or miles away. This type of **pollution** is currently the main cause of **watershed pollution** today. Storm water runoff can collect many different types of **pollution** from different sources before it reaches a body of water, including trash, dirt and chemicals. Non-point source pollutants are often substances that are not intrinsically toxic, but if collected in enough concentration they can be detrimental to the **ecosystem**. You can't 'point' to the specific origin of the contamination because it comes from too many different places and is difficult to trace.

How to do it

1. Tell your group that you are going to explore point and non point sources of **pollution**, make sure they have both concepts clear. Explain that often the **pollution** is not intentional, but rather the result of an accident, a system overload, or the failure of part of a manufacturing process.
2. Explain to your group that they are playing a game. Assemble the participants in a circle. Hand out one 'pollution card' to each one and have them place the cards around their necks so that the words are visible to the group.
3. Start by naming one of the kinds of **pollution** showing on a participant's card. If it is an example of **point source pollution**, ask the group to point to the participant with their index finger. If it is a non-point source of **pollution**, they cannot use their finger, but they must indicate the participant by aiming their bent elbow in his or her direction.
4. The participant indicated must then (as quickly as possible) choose another participant, call out his or her example of **pollution**, and 'point' or 'non-point' to him or her.
5. The game continues, faster and faster, becoming hectic and humorous. If a participant accidentally points 'illegally', he or she must step out of the circle. The circle thus becomes smaller and smaller until only a few participants are left.

Pollution Sources

- An open garbage dump.
- Fishermen that erode a stream bank.
- Loose soil at a construction site.
- A broken pipeline that leaks raw **sewage** into a river.
- Oil runs off a parking lot.
- A septic system leaks.
- Weed killer sprayed in the front lawn.
- A home owner pours oil down the storm drain.
- Manure mixes with rainwater and washes into the stream.
- Chemical released from a manufacturing plant.
- A family dumping garbage in the sea.

- Clothes being washed in a stream.
- Fertilizer from agriculture fields.
- Toxic liquids leak out of a landfill.
- Acidic water seeps from a coal mine.

Discussion

Can you think of other examples of point and **non-point pollution sources**?
Why do you think point sources have decreased?
How do you contribute to pollute your **watershed**? What can you do to change that?

Adapted from: College of Agricultural Sciences, Water Lesson Plans, To Protect Your Streams, Protect Your Mountains, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water/k-5/protect

Exploring Pollution Sources

Level 1 2 3

Aim

To explore possible sources of **watershed pollution**.

Materials

Bag (to collect the samples), gloves.

Time

40 minutes.

Background

Watersheds can be affected by two types of **pollution**: point source and non-point source.

- *Point source pollution* is easy to identify as it can be traced directly to its source. For example, if there is an oil spill caused by an oil tanker, you can 'point' your finger at the exact source of the **pollution**.
- *Non-point source pollution* is much more difficult to identify. Storm water runoff **pollution** is a type of **non-point source pollution**. This means that the **pollution** cannot be traced back to a specific source because it comes from many different sources throughout the **environment**. This type of **pollution** is currently the main cause of **watershed pollution** today. Storm water runoff can collect many different types of **pollution** from different sources before it reaches a body of water, including trash, dirt and chemicals. You can't 'point' to the specific origin of the contamination because it comes from too many different places and is difficult to trace.

How to do it

1. Explain to your group that you are going to look for possible **pollution** sources around your school or youth group grounds. Remind your group that trash can get into a body of water sometimes by mistake and sometimes due to people being careless.
2. Take the participants outside and ask them to identify possible sources of **pollution**, point and non-point. You can have the participants collect samples of trash or pollutants they find around the school or youth group.
3. Take the samples back to the classroom and ask the participants how introducing those items into the local **watershed** might negatively affect the body of water where they will end up. How might this situation affect the wildlife or people there?

Take the necessary safety precautions and supervise your group to ensure that no one collects dangerous articles!

Discussion

Which was the worse source of **pollution** you found? Explain why.
How might **watershed pollution** affect aquatic wildlife?
Is there any source of **pollution** on your neighborhood? What could be a possible solution?

Water Villains!

Level 1 2

Aim

To learn about water **pollution**.

Materials

Villain information cards provided below, colouring pencils, cardboards.

Time

40 minutes.

Background

Water can be easily contaminated by different causes. Water **pollution** is a serious issue as it affects the quality of water and the latter affects all living beings that depend on water.

How to do it

1. Explain to your group that water can get contaminated by different famous and well known 'villains'.
2. Divide your group into six teams and give one of the villain cards to each one. Have them make a drawing of how they believe their villain looks like.
3. Ask each team to present their villain to the rest of the group.

Discussion

Where does each villain come from?
How can these villains affect our health and the health of other living beings?
How can we combat these villains?

Water Villains Cards

Silt and Dirt

We are distributed by bulldozers, trucks and heavy machinery that flow into the water from construction sites and other land areas. There is no one like us! We can block sunlight from entering water and can kill water plants. But that is not all, we can also clog gills of fish and smother small creatures that live in the bottom of a water body.

Chemicals

There are thousands of us and there are hundreds of ways by which we can creep into the water. We flow in with the water that runs off fields with pesticides, from factories or from drains. Once in the water we can kill fish, birds and other animals. We can also be sneakier by gradually collecting in the bodies of these animals for many years and showing our nasty effects much later.

Oils

We are the oil that won't mix with the water. People only remember us when we make the headlines in the news, like when there has been an accident with an oil tanker and there is a terrible oil spill. But the truth is that we are always here, sliming our way into the seas and oceans from the tankers when they clean out their tanks, from oil refineries and even from the city streets.

Nitrates and Phosphates

We reach different water bodies with all the water from fields that have been fertilized, and from all the water used to wash clothes with detergents that contain phosphate. We help lots of algae to thrive, and when these algae decompose, they draw more and more oxygen. So, when you see a green film on the water you can be sure it's us having a blast!

Acids

We are a cool gang, we fly in with the air and mingle with the rain to join the water of lakes and streams, and then we work hard to make the water acidic. We call ourselves **acid rain**. When we arrive with rain and mix with water, the plants and animals living in it can get pretty sick. We can also harm other non living elements, such as your statues and houses; we enjoy making your city look unsightly.

Bacteria and Viruses

You can't see us but we can really harm your health! We can spread water-borne diseases like dysentery, hepatitis or typhoid (just to name a few) when we get into the water you drink. We get into the water with all the sewage, with human and animal waste, that is not treated in a treatment plant. We need lots of oxygen and we grab as much as we can from water, so we don't let many other things live in the water with us.

Source: United Nations Environment Programme, Tunza, A Trip With Drip, http://unep.org/tunza/children/images/flash/a_trip_with_drip/start.swf

Our Water Can Get Sick Too!

Level 2 3

Aim

To learn about water borne diseases.

Materials

An outdoor setting, copies of the maze, pencils, dictionary, water, drinking water,

chocolate powder, glasses, jar.

Time

30 minutes.

Background

Pollution affects the quality of water, and this can affect all living things because we all depend on water. The quality of drinking water is more of a concern. The water we drink needs to have minerals such as magnesium, calcium, iron and some dissolved gases, in proper proportions. But, it should not have any contaminants, of course!

Contaminated water can lead to serious diseases such as cholera, typhoid, jaundice, diarrhoea, dysentery and malaria. These water borne diseases account for nearly one-third of all deaths in the world. It is estimated that every 20 seconds a child dies from a water-related disease.

How to do it

1. First, take your group outside and enjoy playing a fun game. Once they get a bit tired, go back to the class or meeting room.
2. Mix some water with some chocolate powder to make it look 'dirty'. Offer the participants a glass of 'dirty' water. Ask them to look at it, does it look crystal clear? No, explain to them that this water might be polluted. How would they feel if this was the only water they had to drink?
3. Explain to them that contaminated water can lead to serious water borne diseases that cause many deaths around the world. Don't forget to offer them some clean drinking water!
4. Give a copy of the following word square puzzle to each participant, so they can learn about different water borne diseases.
5. Explain to your group that they must look for each of the following words within the puzzle.

- Cholera
- Typhoid
- Jaundice
- Diarrhoea
- Dysentery
- Malaria
- Hepatitis
- Fluorosis

6. Once they finish, review each term with your group.

Discussion

Do you think it is fair that some people do not have access to clean, healthy water?
Do you know someone that has been sick because of any water borne disease?
How do you feel knowing that such a vital liquid can make people sick? Is there something you can do about it?

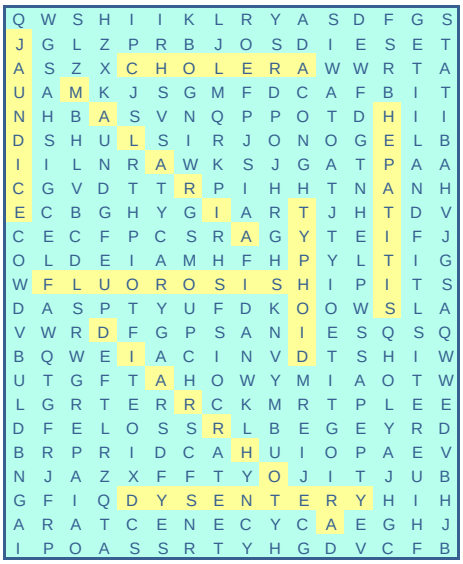
Adapted from: United Nations Environment Programme, Tunza, Children, A Trip With Drip, http://unep.org/tunza/children/images/flash/a_trip_with_drip/start.swf

Water Borne Diseases Square Puzzle

Be careful, words may be spelled across, down and diagonally. Have fun!

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

Solution:



What is Wrong With My Pond?

Level 2 3

Aim

To explore the importance of water quality to keep pond water safe for wildlife and plants.

Materials

Four samples of pond water (participants can help collect them), Eco Check five-in-one test strip for pond water (or similar test strips), Pond Care ammonia kit (or similar), one Data Sheet per group, pencils.

Time

One hour.

How to do it

1. Explain to your group that they are conducting some water quality tests. Split them into groups of about three to four students and give them the following scenario: *You are a new pond owner. Come up with at least three things you want from your pond.*
2. Have a group discussion based on the participants' answers. Lead discussion on water quality. Use the following background information as a guide:
   Water quality will play a role in whatever use you intend for your pond. Things like Nitrates, Ammonia, pH, hardness, and alkalinity can all affect the pond's quality. Let's assume most of you are looking for the pond to be able to have fish like Koi. We need to review the basic tests that we will perform and what the adequate levels for a successful Koi pond would be.
3. Have the participants review the following information:

   Nitrates (NO_3^-): which are found commonly in fertilizers can cause higher than wanted algae levels and plants in the pond. We are looking for a value less than 20 ppm. If levels are too high we may need to address the land management around the pond. Is there fertilizer running into the pond from surrounding areas? What can we do to fix that? (Buffer strips around pond, limit fertilizing).

Hardness: is a measurement of calcium and magnesium along with other minerals in the water. A hardness that is too high will have too much algae and hardness that is too low will have too little vegetation. Koi require somewhat harder water because it prevents the salts within fish to be diffused through their gills and lowers the stresses on the fish. We are looking for levels between 150 – 300 ppm. Different salt solutions (except table salt) can be added to the water to increase the hardness.

pH: a pH test measures how acidic the water is. Water with a value lower than seven is acidic and water with a value higher than seven is alkaline. Anything between six and a half and nine is adequate for Koi. Algae blooms can greatly affect the pH and need to be closely monitored.

Alkalinity: is the ability for the water to accept acidification without affecting the pH. For Koi, ponds with a value of 40 – 120ppm is acceptable. Values that are too low can be treated by adding lime to the water.

Ammonia: it is caused by decaying organic material and fish waste. It can cause gill damage, stress and other diseases. Even low levels of ammonia can become quickly harmful. We are looking for levels under 0.1 ppm. If levels are too high there are bacteria additives for the water that must be mixed in to reduce the ammonia levels.

4. In the groups, the participants can begin to test the water samples and record the data on the Data Sheet. After completing the testing the group needs to decide which pond samples would be adequate for Koi and which would not.

Discussion

What determines a successful Kio pond? Give specific examples.
Say you have tested a water sample and the Nitrate levels are too high. What is a possible cause for this and what can be done to correct the situation?
How does chemistry play a role in testing and correcting pond water?

Source: College of Agricultural Sciences, Water Lesson Plans, What is Wrong With My Pond?
http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water/6-8/pond

Pond Water Testing Data Collection Sheet

Names: _____ Date:_____
_____
_____
_____

Test	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Nitrates					
Hardness					
pH					

Alkalinity					
Ammonia					

Which samples are able to support Koi?_____

Non-Point Source Pollution

Level 1 2 3

Aim

To demonstrate what an average storm drain collects during a rainfall event and how the water from storm drains can impact the water quality and aquatic **environments** of local water bodies.

Materials

- Waterway: aquarium, rectangular box, water, watering can, spray bottle.
- Pollutant: green and red food colouring (pesticides/herbicides), three cups, vegetable oil (motor oil), soil/sand/leaves/pebbles (erosion), grass clippings (or shredded paper), three twigs, paper waste, food scraps and cafeteria waste.

Time

One hour.

How to do it

1. Introduce this activity with a discussion of storm drains and storm drain systems and their purposes.
   - Where are storm drains typically found? (Alongside curbs or embedded in pavement, parking lots, bridges, etc.)
   - What things might enter a storm drain? Encourage stories regarding balls, toys or other items that have been accidentally dropped into storm drains or sewers by the participants, their friends or family members.
   - What is the purpose of a storm drain and how does it relate to a storm? (**Flood** control measure).
   - Where does the water and objects that float down into a storm drain go? (In most cases water is carried by a pipe into a nearby waterway). Introduce the term 'storm water' to the group.
   - What other materials can enter storm drains with storm water? List suggestions on the board. Examples include litter, fertilizer, road salt, oil,

sand, soil, leaves, twigs, animal waste and hazardous waste that have been dumped into drains or soil, etc.).

2. Explain that the group will make a storm drain in order to learn more about its purpose and the types of materials that can fall into it.
3. Fill the aquarium half-way with water and place it on an **accessible** area where it can be easily viewed by the participants. This water represents the river into which the storm water drains after it has rained. Storm water travels from the street through a storm drain and into the river.
4. Cut a hole in the bottom of the box and place the box on top of the aquarium. The box represents the storm drain. Leave the sides of the aquarium uncovered so that the students can view its contents.
5. The eight scenarios described below provide realistic examples of the types of water **pollution** that enter storm drains in neighborhoods and communities. Divide the participants into eight groups and assign a scenario to each one. The simulated materials should be placed on a table and numbered appropriately for the scenarios.
6. Invite each group to introduce their scenario, first they should read it and then they should place their pollutant into the storm drain (box opening on top of the aquarium). Use the watering can to create rain to wash the pollutant into the waterway. After each scenario, ask the participants to draw conclusions regarding the concerns or problems that the scenario presents. It is also beneficial to ask if the people in the scenario meant to do what they did and how many of them know someone who also does this. Discuss the following questions: How does the pollutant damage the **environment**? Do the people who are responsible for the pollutant want to damage the **environment**? How can this type of **pollution** be stopped?
7. After adding all the pollutants, examine the contents of the waterway. Discuss how the waterway has changed and how viewing this change makes the participants feel.

Discussion

What types of **pollution** are natural?
What types of **pollution** are added by people living in the local communities?
How can we remove the **pollution** from the water?
What could be done to stop pollutants from entering storm drains?

Source: College of Agricultural sciences, Water Lesson Plans, Watch What You Do To Your Storm Drain, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water/k-5/storm-drain

Scenario Cards

Scenario #1: Mrs. Howard has two small trees next to the house porch. The trees attract wasps, mosquitoes and caterpillars. She sprayed the trees with a chemical to kill or drive away the insects. A storm occurs soon after she sprayed and most of the chemical is washed off the leaves and taken onto the sidewalk and driveway. From there it is washed with rainwater into the storm drain along the curb.

Simulated Pollution: Mix two to three drops of green food colouring with the water in one of the cups. Empty this green water into the opening on top of the aquarium

Scenario #2: A small stream winds through a popular golf course. During a heavy rain the stream is filled with fast flowing water. In certain places the sides of the stream are wearing away and tree roots are showing. During and after each rain, soil, sand, leaves, pebbles and other natural debris are swept away with the heavy flow of water as the shores of the stream slowly collapse. This material is eventually carried by the stream into the river that it empties into.

Simulated Pollution: Add the mix of soil, sand, leaves and pebbles into the opening on top of the aquarium.

Scenario #3: Susan enjoys helping her father change the motor oil in the family automobile. She clumsily carries the huge pan of black, thick used motor oil to the storm drain in front of their apartment building, where she dumps it. It's gone! Eventually the oil will mix with the water of a nearby stream or river; and any motor oil that she spilled onto the ground will go into the soil and mix with water that is underground.

Simulated Pollution: Empty the vegetable oil into the opening on top of the aquarium.

Scenario #4: One snowy winter evening the Palmer family heard raccoons outside opening and turning over their garbage cans left out by the curb, but it was too dark and cold to go outside and chase them away. The next morning no one in the family had time to clean up the litter that was strewn all over the street. When the snow melted most of the trash floated with the water into the storm drain.

Simulated Pollution: Add the paper waste through the opening on top of the aquarium.

Scenario #5: One of Matthew's jobs at home is to cut the lawn each week after school. When the grass catcher is full he dumps the grass clippings into the nearby ditch or sewer, whichever one happens to be closer to the lawnmower at the time. While in the ditch or drain the clippings turn yellow and begin to rot and smell until water from the next rainstorm carries the clippings away.

Simulated Pollution: Add grass clippings through the opening on top of the aquarium.

Scenario #6: Mary enjoys walking the family dog, Spot. When Spot needs to go to the bathroom she is careful to make Spot go on the paved road along the curb so that Spot doesn't create a mess on the neighbors' lawn. She doesn't worry about picking up the mess because she knows that eventually the dog's waste will be washed with the rain into the nearby storm drain.

Simulated Pollution: Put the three twigs through the opening on top of the aquarium.

Scenario #7: The Smith family enjoys stopping at a fast-food restaurant for dinner while on their way to the beach for the weekend. To save time, the family eats inside their mini-van that is parked in the restaurant parking lot. In order to keep the car clean, they leave their bags of food trash on the pavement in the parking lot for the workers to pick up, since there are no trashcans in the parking lot. This family may not realize that animals and wind will eventually open up the bags and spread this trash around. If it isn't picked up it can be carried by rainwater during the next storm into a nearby storm drain.

Simulated Pollution: Add food scraps and food wrappers through the opening on top of the aquarium.

Scenario #8: A maintenance worker employed by a resident's association for some townhouses must take on new summer duties for the landscaper while he is out sick. These duties include lawn care for each of the

residences. The procedure of spreading weed killer takes about three days to complete and two days after he began an all-day rainstorm kept him indoors. The maintenance worker failed to realize that the downpour would wash away most of the weed killer that was already applied on the lawns. In fact, the chemicals would most likely be washed from plants and pavement into the nearby storm drains.

Simulated Pollution: Mix two to three drops of red food colouring with the water in one of the cups. Empty this brown water into the opening on top of the aquarium.

The Water Down Under

Level 1 2

Aim

To learn about the importance of water quality in aquatic **habitats**.

Materials

Internet access, pencils, notebooks, colouring pencils, colouring markers, papers.

Time

Two 50 minutes lessons to finish reading the story.

How to do it

1. Explain to your group that you are reading a fun detective story that highlights the importance of monitoring water quality in order to protect and conserve aquatic **habitats**.
2. You can find the story in the World Water Monitoring Day web page:
   - *The Water Down Under* by Deborah Rodney
     www.worldwatermonitoringday.org/The_Water_Down_Under.aspx
3. Read the story with your group, you can ask them to help you read it. Tell the participants to take notes about important clues and to write down any questions they might have.
4. Once you finish reading, encourage discussion. You can also have them make a drawing about how they think the lake looked once the mystery was solved.

Discussion

How do people have an effect on water bodies?
How can animals and plants be affected by polluted water? How are people affected?
How important where observation and scientific testing in solving the case?
Why is it important to constantly monitor waterways?

Plants & Water Pollution

Level 1 2

Aim

To learn that plants have a role in water purification.

Materials

One clear vessel, celery stalks, one beaker (or jar), red food colouring, water, knife, paper, pencils.

Time

A 20 minutes lesson to prepare the activity and another 20 minutes lesson to discuss about the outcomes.

Background

Many people fail to realize that plants are essential to the health of our water supply. Wetlands and their plants are an increasingly popular alternative for filtering **wastewater** from homes, factories, schools, and businesses. Plants growing in a wetland filter pollutants out of runoff, rainwater, and **wastewater** before it enters bodies of water. The tangle of leaves, stems, and roots in a densely vegetated wetland trap trash and particles of sediment. These remain in the wetland, while the cleaner water moves away. As water moves through a wetland, plants also take up toxic pollutants and **nutrients**. **Nutrients** are used by the plant for metabolism and growth while other substances are stored in the tissues of the plant.

In a natural system, plants are fairly efficient at keeping the system in balance even when there is a naturally occurring flow from upstream. However, when human activities in the water and on land add **nutrients**, sediment, and toxic pollutants, plants cannot clean everything. We must be careful that our activities will not send pollutants into the water.

Many pollutants run off of the land from construction sites, highways, streets, and the communities in which we live. Sometimes ponds are built to filter runoff from these sites. These ponds are ditches, which are often planted with wetland plants to aid in the filtering. Rain and runoff also rest a bit here before moving on. This means that many of the pollutants, especially soil particles, settle to the bottom while the cleaner water drains off from the top. These ponds or ditches are called storm water management ponds.

How to do it

1. Explain to your group that you are conducting a small experiment about water quality and plants. Scientists and engineers test community water to ensure its safety.
2. Ask a participant to pour a cup of water into a large clear vessel and explain that this is clean water that is suitable for human use. Have another participant add one drop of food colouring and explain that this represents **pollution**. Everyone can see the colour the water takes on. Can they see the **pollution**?
3. Ask another participant to add more and more water and ask at points along the way if they can still see the **pollution**. As the vessel fills the colour becomes diluted and is not very intense. It is not noticeable anymore. Is the **pollution** (food colouring) still there?
4. Next, prepare a solution in a beaker by adding several drops of food colouring to water, once again this will represent **pollution** by a toxic substance (a pesticide, for example). Ask your group to come up with other examples.

5. Ask the participants to imagine water flowing through a wetland that has many plants. Explain to your group that the stalks of celery are similar to plants growing in a wetland, such as sedges, cattails, and grasses.
6. Cut off the bottom centimetre of the celery stalks and place them in the water overnight. ***You must continue with the activity the day after.*** (Or you can prepare the demonstration one day before the lesson). Over time the coloured water will travel by capillary action up the stalk. This will be a visible demonstration of how plants can absorb pollutants with the water they 'drink'. Guide the participants to hypothesize what they think will happen and record their responses on a class chart.
7. The next day, the coloured water may or may not be visible on the outside of the stalk. Cut off 3 cm pieces of the celery and hand them to the participants to study closely. They will see coloured dots on the cross sections, which are water-filled channels in the celery. Have the participants answer the following questions:
   - How do wetland plants help purify water? (They purify water by taking up pollutants from it).
   - Why is the water remaining in the beaker still polluted? (Plants can only do so much. As new, hopefully clean, water flows into the system, the pollutants will be somewhat diluted and the water a bit less polluted. If the water continues to flow on to other parts of the wetland, other plants will continue to remove pollutants. Wetland soil also helps to filter out some pollutants).
   - Where does the water go after uptake into the plant? (It is transpired out through the stomata (pores) in the plants' leaves and usually evaporates).
   - What happens to the pollutants? (Some are used in the plants' metabolic processes, some are transformed into less harmful substances, while others are stored in the plants' tissues and could be re-released into the **environment** if the plants die).
   - Why can't we simply dump all of our waste into wetlands? (Wetlands can only do so much, lots of pollutants still end up in the water. Too many pollutants will harm or destroy a wetland. The best solution is to reduce the **pollution**).

     * *As an extension, you can ask the participants to write a plan for how they would control pollutants if they owned a large plant nursery.*

Discussion

How does water **pollution** affect plants?
How might this **pollution** affect animals, including human beings?
What change do you think needs to be made in your community to avoid polluting water bodies? Can you do something to help?

Adapted from: United States Environmental Protection Agency, The Water Sourcebooks, Water Treatment Plants, http://water.epa.gov/learn/kids/drinkingwater/upload/The-Water-Sourcebooks-Grade-Level-6-8.pdf

Oil Spills!

Level 1 2

Aim

To feel and observe the effects of oil on water and other different materials.

Materials

Whiteboard, whiteboard markers, vegetable oil, black tempera paint, water, two containers or basins, fur scraps, feathers, leaves, sand, pebbles, shells, wood scraps, paper towels (to clean up).

Time

50 minutes.

Background

Over the past years our world has faced **habitat** destruction and environmental contamination. More and more creatures are being threatened because of different activities humans develop each day. In the recent past, oil spills have caused major problems to different animals and plants. But a worrying fact is that currently almost 90 percent of the oil in the ocean comes from smaller discharges from oil-tankers, especially when these are cleaned out. It is estimated that over one million tonnes of oil are spilled into the ocean each year from ships and oil rigs.

Habitats have been destroyed and many animals have died. Oil clogged the feathers and respiratory tracts of sea birds. Fish, shellfish and other sea animals, including plankton, also died due to the oily waters. The film of oil on the surface reduced the amount of light and oxygen passing into the water, causing underwater marine life to suffocate to death.

Fortunately, when such terrible accidents happen, different groups work to mitigate the consequences. One important step toward this is to understand the effects of oil on water and different animals and plants.

How to do it

1. Explain to your group that they will observe and describe oil and water, and different materials introduced into them.
2. Use black tempera and vegetable oil to make pretend crude oil.
3. Put some water in the two basins; and spill the oil in one of the basins.
4. Tell the participants that their right hand will only go inside the water basin and their left hand will only go inside the water and oil basin. Ask each participant to place one hand in each container and to move them around to see how it feels. Ask them to describe each basin using only words; list them under the appropriate headings, oil and water or water.
5. Divide the participants into small groups and give each one any of the following items to submerge in both basins, first in the water basin and then in the water and oil basin: fur scraps, feathers, leaves, sand, pebbles, shells and wood scraps. Allow the participants to investigate the changes that occur in the texture of these materials.
6. Ask each team to describe, compare and contrast how the items feel in the two containers using the list of words they created previously.

Make sure you clean up when you are finished!

Discussion

How did the water change after adding the oil?
How did the oil affect the different elements you used? How might oil affect animals and plants in real life?

How do oil spills affect human beings?

Adapted from: Alaska Oil Spill Curriculum k-3, Oil exploration, www.pwsrcac.org/outreach/Curriculum/gradesK-3.pdf

Cleaning Time

Level 1 2 3

Aim

To understand why it is such a difficult task to clean up an oil spill.

Materials

One 28 cm x 19 cm x 4 cm clear glass baking dish (or equivalent), water, blue food colouring, 12 tbsp. vegetable oil, 8 tbsp. pure cocoa powder, 1 tsp. table salt, a tablespoon, a teaspoon, five paddle-pop sticks, a coffee mug, sorbents (paper towel, cotton balls, rag, string, nylon pot scrubber, sponge, styrofoam cup, garden peat moss), one squirt of liquid dishwashing detergent, tweezers.

Time

One hour.

How to do it

1. Explain to your group that you are going to try to clean up an oil spill.
2. To prepare the fresh water, fill the baking dish with cold tap water within 1 cm of the rim, add five to six drops of food dye and mix well. Let the solution settle.
3. To simulate the crude oil, place three tablespoons of vegetable oil in the mug, add two tablespoons of cocoa powder and mix thoroughly with a paddle pop stick.
4. To contaminate the fresh water, very slowly pour the simulated crude oil from a height of 1 cm onto the top of the fresh water dish. If you pour the oil too quickly, the experiment won't work. Wait three minutes to see what happens.
5. To test the sorbents, place a small sorbent sample into the centre top of the contaminated fresh water:
   - How much oil did the sorbent clean up? How quickly?
   - Does the sorbent pick up water too? If so, how can you tell?
   - Does the sorbent sink or float?
6. Remove the sorbent using the tweezers and repeat step one with other sorbent samples. Clean out the contaminated fresh water. Keep track of the amount of time it takes to clean up the oil spill using the different methods. Of the sorbents you tested, which one worked the fastest? The best? What other materials could you use as sorbents?
7. Prepare new simulated fresh water following the instructions above and add oil to contaminate it.
8. Add detergent to the oil-contaminated fresh water:
   - What happened when the detergent was added to the contaminated water?

- Where would the oil go in 'real' **freshwater** after a dispersant (like the dishwashing detergent) is used?
- How clean is the **freshwater** now that it has dishwashing liquid in it?

9. Repeat all of the above procedures substituting the **freshwater** for ocean water. To prepare the ocean water, follow the fresh water procedures, add one teaspoon of salt, and mix it with the water before adding the crude oil.

Discussion

What happened to the oil when you dropped it on the **freshwater**/ocean water? Did it sink? Float? Mix in?
How would you pick up the oil-contaminated material in a real oil spill in **freshwater**/the ocean?
How would you dispose of the oil-contaminated material in a real oil spill?
When oil reaches the shoreline, what other problems might occur?

Source: Australian Maritime Safety Authority, Experiment to Clean Up an Oil Spill, www.amsa.gov.au/marine_environment_protection/Educational_resources_and_information/Teachers/Classroom_Projects/Clean_up_oil_spill_exercise.asp

Water Scarcity

Level 2 3

Aim

To understand the problem of **water scarcity** around the globe.

Materials

World map, poster boards, markers, colouring pencils, internet access, atlases or encyclopedias for research, 601 items for counting (could be candies, coins, paperclips, etc.).

Time

70 minutes.

Background

Water is one of Earth's most valuable resources, but also one of the **scarcest**. Water is necessary for survival, but some parts of the world have better access to clean, easily attainable water than others. In some countries obtaining water is as simple as turning on the faucet, while in other places women and children must walk various miles every day to collect **freshwater**. In addition to variations in the allocation of resources across the world, there can still be inequality even within each country. Depending on distribution, governance and resource management, even regions with plenty of access to water can have portions of their population facing **water scarcity** issues, and vice-versa. Water **sanitation** is also an issue, as filthy water can lead to disease and even death. For these reasons, it is important to realize that the entire Earth shares a small percent of **freshwater**, and that it is vital to protect and conserve this resource.

How to do it

1. Begin the lesson by discussing with the participants what water is used for and why it is so important; guide the discussion with the following questions: why do we need water? What type of activities is water used for? Do you think it is possible to run out of water? What would happen if our water supply was reduced?

2. Explain to your group that everyone in the world has to share a small amount of **freshwater**, and that they will make a research about water use in different countries. *Out of the Earth's total supply of water, 97.5 percent is salt water and only 2.5 percent is **freshwater**. Furthermore, almost 70 percent of that **freshwater** is frozen and trapped in the Antarctic, the Arctic and glaciers, and not available to humans. This means that less than 1 percent of the world's fresh water is available for humans and other inhabitants of the Earth.*
3. Split the participants into eight groups and assign each group one of the following countries to learn more about: United States, Norway, India, Australia, Kenya, Mexico, Brazil, and Germany. Give each group a copy of the *Discover a Country* sheet, to guide their research; they can use the internet, atlases, encyclopedias, etc.
4. Bring out a world map and ask each group to present their country. Have them point out the location of the country and tell their classmates what continent it is on, what the **climate** is like there, and their fun fact.
5. For each group presentation, ask the participants questions on how they think water access for that country differs from other parts of the world. Their answers should be based on their research, and also group brainstorming to make educated guesses. For example, how much rainfall do they get? (A dry country like Kenya would have more frequent **droughts** than much of the United States, which gets more **precipitation**). Where does their water come from (lake, river, the faucet, etc.)? Do they have plumbing or **sanitation** systems? Is **pollution** a problem?
6. Once you are done with the presentations, explain to your group that you are playing a game. Have the participants sit in groups according to their countries. Each group will get one counting item for every litres of water an average person uses per day in their country. Pass out the allotted counting objects, or have the groups count out how many items their country gets based upon the following:
   - *United States* - 570 litres per person/per day
   - *Norway* - 300 litres per person/per day
   - *Kenya* - 45 litres per person/per day
   - *India* - 132 litres per person/per day
   - *Australia* - 492 litres per person/per day
   - *Mexico* - 363 litres per person/per day
   - *Brazil* - 185 litres per person/per day
   - *Germany* - 189 litres per person/per day
7. Once the participants have the correct number of objects, ask them to look around and compare how many items they have in comparison to other countries. Who has the most? Who has the least? Why do they think that is?
8. Using the amounts below, the participants should decide as a group how they want to spend their daily water allowance. Have them take away the items as they are used up so they can visualize how much is left. The groups will need to think about what they really need to use their water for, especially in countries that do not have very much water.
   - *Bath:* 189 litres

- **Shower:** 8 litres per minute
- **Teeth brushing:** 4 litres
- **Hands/face washing:** 4 litres
- **Dishwashing by hand:** 19 litres/load
- **Clothes washing (machine):** 38 litres/load
- **Toilet flush:** 11 litres
- **Glasses of drinking water:** 250ml per glass (quarter of a litre)

9. Discuss with the participants what they think are the most important things to use their water allotment on. Also ask them if there are alternatives choices to items on this list. For example, using an outhouse or latrine, washing out of a bucket instead of using running water, hand-washing clothes in a tub, etc. Have them examine what they are using their water for in comparison to other countries, and how much they are conserving or wasting compared to other countries.

Discussion

How and why does water availability differ around the globe?
Do you think water should be more evenly distributed? Why?
How would your life change if you didn't have access to sufficient and clean water?

Source: Earthday Network, Water Scarcity,
http://eeweek.org/assets/files/EDN%20Water%20Lessons/Water_Scarcity_2-4.pdf

Discover a Country

What is the name of your country? _____

What continent is your country found on? _____

What is the climate like in your country? Is it normally hot or cold? Wet or dry?

_____

_____

Where do people get water from in your country? Is it clean water?

_____

_____

Give a fun fact about your country

_____

_____

Climate Change Expedition

Level 1 2 3

Aim

To explore the effects of **climate change** and its relation to water.

Materials

Computer with internet access.

Time

One hour.

Background

The Earth's **climate** is changing, but in ways that you can't easily see. The Earth is getting warmer because people are adding heat-trapping gases to the **atmosphere**, mainly by burning **fossil fuels**. These gases are called **greenhouse gases**. Rising global temperatures lead to other changes around the world, such as stronger hurricanes, melting glaciers, and the loss of wildlife **habitats**. That's because the Earth's air, water, and land are all related to one another and to the **climate**. This means a change in one place can lead to other changes somewhere else. For example, when air temperatures rise, the oceans absorb more heat from the **atmosphere** and become warmer. Warmer oceans, in turn, can cause stronger storms. The Earth's **climate** has changed before, but this time it is different. People are causing these changes, which are bigger and happening faster than any **climate changes** that modern society has ever seen before.

How to do it

1. Start by reminding your class about **climate change** and it causes. How do our activities contribute to the rise in global temperature?
2. Explain to your group that they will go on a Climate Change Expedition that will help them to learn about the different effects of **climate change**, which are already affecting our world and its inhabitants. You will be using the *United States Environmental Protection Agency, A Student's Guide to Climate Change* web page:
   - *Climate Change Expedition!*
     www.epa.gov/climatechange/students/expeditions/tropical/index.html

   During the trip you will be visiting different places, so you can visit all the places together or you can assign a group to each stop and have them make a small presentation for the rest of the participants.
3. Encourage discussion!

Discussion

What is the most interesting thing you learned?
Did you know **climate change** was provoking so many changes, especially related to water?
What are some things you can do to help prevent global warming?

Climate Change & Extreme Droughts

Level 3

Aim

To explore how **climate change** affects the availability of water around the world.

Materials

Notebooks, pencils, copies of the text box.

Time

One hour for the reading exercise and group discussion, and another 40 minutes to discuss about their homework.

Background

Average global surface temperatures were 0.8 °C warmer during the first decade of the 21st century than during the first decade of the 20th century, and the most pronounced warming has been over the past 30 years. The actual global warming trend is rising atmospheric concentrations of **greenhouse gases**, especially carbon dioxide (CO_2), from fossil fuel use. Additional lesser amounts of **greenhouse gases** have come from deforestation and from other land use and land cover changes. Emissions of CO_2 from fossil fuel use have been rising since the Industrial Revolution (i.e. since the mid-1700s); and by the 1950s, the atmospheric concentration of CO_2 had risen from pre-industrial levels of 284 parts-per-million (ppm) to 300 ppm – the highest level in at least 800 000 years. By 2010, emissions of CO_2 from **fossil fuels** had risen to the highest level in history: 9.1 billion tonnes of carbon, and atmospheric concentrations followed suit, reaching 388.5 ppm that year.

The rising global temperatures and atmospheric CO_2 concentrations will bring dangerously disruptive changes to **climate**. Increases in the frequency and severity of **floods** and **droughts** are already affecting our world. Experts have described an even worse scenario as they believe that the resilience of many **ecosystems** (their ability to adapt naturally) is likely to be exceeded by an unprecedented combination of change in **climate**, associated disturbances (e.g. **flooding**, **drought**, wildfire, insects, ocean acidification) and other global change drivers (especially land-use change, **pollution** and over-exploitation of resources), if greenhouse gas emissions and other changes continue at or above the current rates.

How to do it

1. Start by reminding your group what **climate change** is and how it is affecting our **environment** and its people due to the increase of extreme **weather** events.
2. Have the participants read the text box about *Extreme Droughts in the Amazon* of the *World Wildlife Fund Living Planet Report 2012*, which will give the participants a clear idea about the consequences of **climate change** and how it is related to water.
3. Next, encourage a group discussion so the participants can obtain more ideas and opinions about the topic.
4. Explain that, as homework, the participants will have to write an essay based to the following statement: *'The main impacts of climate change on humans and the environment occur through water.'*
5. In the next meeting, ask each participant to present a summary of the main ideas he or she included in his or her essay.

Discussion

What other consequences might the **droughts** in the Amazon bring to people?
Why can we say that we all have to make better choices for a living planet?
How are the protection of the **environment** and water security related?

Extreme Droughts in the Amazon

Scientists are concerned that climate change may bring increasingly arid conditions (along with more frequent extreme droughts) to the Amazon, resulting in net carbon losses from the region's forests to the atmosphere. Those concerns were highlighted in 2005 when a "once in a century" drought affected the Amazon, with impacts so severe that the government declared a state of emergency for much of the area. The drought resulted in a massive release of 0.8-2.6 Gigatons (billion metric tonnes) of carbon to the atmosphere. This can be compared to global emissions of CO_2 from fossil fuels in 2005 of 7.4 Gigatons of carbon.

In 2009, the World Wildlife Fund identified the prospect of more frequent extreme droughts in the Amazon and the related rainforest dieback as being among the "tipping points" that could be passed in coming decades as climate changes, with significant impacts within the first half of this century. The very next year, in 2010, another extraordinary drought afflicted the region, this time with perhaps even greater emissions, estimated at between 1.2 and 3.4 Gigatons of carbon. "The two recent Amazon droughts demonstrate a mechanism by which remaining intact tropical forests of South America can shift from buffering the increase in atmospheric carbon dioxide to accelerating it," said researchers in the 4 February 2011 issue of *Science*. "If drought events continue, the era of intact Amazon forests buffering the increase in atmospheric carbon dioxide may have passed."

Source: World Wildlife Fund, The Living Planet Report 2012, Extreme Droughts in the Amazon, http://awsassets.panda.org/downloads/1_lpr_2012_online_full_size_single_pages_final_120516.pdf. page 95.

Water & Human Growth

Level 1 2

Aim

To understand how population growth can affect water.

Materials

White construction paper, pencils, rulers.

Time

40 minutes.

Background

Water scarcity is among the main problems to be faced by all societies and countries in the 21st century. The factors placing the greatest pressure on water are population growth and the increased consumption resulting from higher average incomes per person. Water use has been growing at more than twice the rate of population increase in the last century, and, although there is no global **water scarcity** as such, an increasing

number of regions are chronically short of water.

Water scarcity is both a natural and a human-made phenomenon. There is enough **freshwater** on the planet for six billion people but it is distributed unevenly and too much of it is being wasted, polluted and unsustainably managed. It is everyone's responsibility to start valuing water as a precious resource and to analyze how water-intensive are our consumption patterns.

How to do it

1. As a group, reflect about water and population growth, how might water sources be affected?
2. Give each participant a large piece of white construction paper and ask them to divide the page into six equal sections using a pencil and ruler.
3. As you read each of the following scenarios, have the participants draw pictures illustrating what you have stated in each of the six sections of their paper. As they draw successive pictures, they should modify the size and appearance of the water and the number of fish in the lake to reflect the changes that are occurring.
   * Ask the older participants to write captions to describe in their own words what is happening in each of their six scenes.

   - *Ten fish swim happily in a clean lake.*
   - *A person decides to clear his land and develop a farm near the lake.*
   - *A family decides to build a house by the lake.*
   - *Two more families decide to build houses by the lake.*
   - *The farmer needs more water for his crops and animals.*
   - *All of the houses need more water for their everyday activities.*

4. Ask each participant to present his or her work and encourage discussion.

Discussion

What do the plants, animals, and people in the pictures use the water for?
What changes have humans provoked to this lake **ecosystem**?
Why is it important that this water be kept clean and plentiful?

Hot Water Game

Level 1 2

Aim

To understand some key terms related to global water pressures.

Materials

Red construction paper, scissors, adhesive tape, paper, pencil, small basket.

Time

One hour.

How to do it

1. Explain to your group that they are playing a game that will help them explore some terms related to the problems that people are facing due to the lack of access to clean water and proper **sanitation**. The object of the game is to stay out of 'Hot Water.' Hot

water can either be a location in the classroom or a designation that the student is no longer participating in the game. Examples of designations (other than a special location in the classroom) are red droplets of water cut out of red construction paper.

2. To play, the participants must come to the front of the room either individually or in pairs and draw a term out of the basket (separate the terms from the definitions before placing in a container). If the participants are working in pairs they will each have an opportunity to explain the meaning of a single term they draw. If successful, they simply return to their seats to continue to play. If the participants cannot relate the meaning of the term they may pick up a red droplet of water to tape to their desk so that the leader or teacher can see they are no longer participating and will wait until the next round to re-enter the game.
3. Once you have finished reviewing the meanings of all the words, ask the participants to make a sentence with each word.

Vocabulary

- Scarce: not easy to find or get.
- Potable: fit or suitable for drinking.
- Well: a hole drilled into the earth to obtain water.
- Disease: extreme illness.
- Sanitation: the application of measures to maintain clean, hygienic conditions that help prevent disease.
- Contaminate: to make unsuitable by contact or mixture with something unclean.
- Accessible: easy to approach, reach, enter, or use.
- Pollution: natural **environment** being contaminated with harmful substances.
- Hygiene: practices, such as frequent hand washing, that contribute to the promotion and preservation of cleanliness and health.
- Rural: of the countryside.
- Disaster: an event that results in great harm or damage
- Thirst: a need for something to drink.
- Climate change: a change in the overall state of the Earth's **climate** (such as temperature and rainfall) caused both by natural and human causes.
- Flood: when an area of land becomes covered by water due to, for example, heavy rain.
- Drought: a long period of unusually low rainfall, leading to a shortage of water.
- Wastewater: water that is not clean because it has already been used by homes, businesses, factories etc.
- Human rights: the basic things which all people should have or is entitled to, such as justice, freedom to say what you think and access to safe drinking water and **sanitation**.
- Consumption: when someone uses, eats, or drinks something.

Discussion

Why are countries consuming more water every time?
What do you need water for? Does this water need to be clean?
Why is it difficult for many people to find clean drinking water? How does this impact people lives?

Adapted from: Water Partners International, Global water Supply, Elementary School Curriculum, Hot Water Game, http://static.water.org/pdfs/WPElemCurricFULL.pdf

Let's Write for Sanitation

Level 2 3

Aim

To reflect about **sanitation** and its relation to **human rights**.

Materials

Paper, notebooks, pencils.

Time

One hour.

Background

Having access to safe drinking water and **sanitation** is central to living a life in dignity and upholding **human rights**. Yet billions of people still do not enjoy these fundamental rights. The rights to water and **sanitation** require that these are available, **accessible**, safe, acceptable and affordable for all without discrimination. These elements are clearly interrelated. While access to water may be guaranteed in theory, in reality, if it is too expensive, people do not have access. Women will not use **sanitation** facilities which are not maintained or are not sex segregated. Having a tap which delivers unsafe water does not improve one's access. **Human rights** demand a holistic understanding of access to water and **sanitation**.

On 28 July 2010, the United Nations General Assembly explicitly recognized the human right to water and **sanitation** and acknowledged that clean drinking water and **sanitation** are essential to the realization of all **human rights**. The Resolution calls upon States and international organizations to provide financial resources, help capacity-building and technology transfer to help countries, in particular **developing countries**, to provide safe, clean, **accessible** and affordable drinking water and **sanitation** for all.

What does it mean:

- ### Sufficient

  The water supply and **sanitation** facility for each person must be continuous and sufficient for personal and domestic uses. These uses ordinarily include drinking, personal **sanitation**, washing of clothes, food preparation and personal and household **hygiene**. According to the World Health Organization (WHO), between 50 and 100 litres of water per person per day are needed to ensure that most basic needs are met and few health concerns arise.

- ### Safe

  The water required for personal or domestic use must be safe, therefore free from micro-organisms, chemical substances and radiological hazards that constitute a threat to health. Measures of drinking-water safety are usually defined by national and/or local standards.

- ### Acceptable

  Water should be of an acceptable colour, odor and taste for personal or domestic use. All water and **sanitation** facilities and services must be culturally appropriate and

sensitive to gender, lifecycle and privacy requirements.

- ### Accessible

  Everyone has the right to water and **sanitation** services that are physically **accessible** within, or in the immediate vicinity of, their household, workplace and educational or health institutions. According to WHO, the water source has to be within 1 000 metres of the home and collection time should not exceed 30 minutes.

- ### Affordable

  Water and **sanitation** facilities and services must be available and affordable for everyone, even the poorest. The costs for water and **sanitation** services should not exceed five percent of a household's income, meaning services must not affect peoples' capacity to acquire other essential goods and services, including food, housing, health services and education.

Source: UN Water for Life Decade, The Human Right to Water and Sanitation, www.un.org/waterforlifedecade/pdf/human_right_to_water_and_sanitation_media_brief.pdf

How to do it

1. Have your group reflect about **sanitation** and their capacity to lead a healthy and happy life. How would their life change if they didn't have access to proper **sanitation** facilities? Have them discuss about the following facts:
   - Every day, 7 500 people die due to a lack of **sanitation**, 5 000 of whom are less than five years old.
   - Every year, 272 million schooldays are missed due to water-borne or **sanitation**-related diseases.
   - One out of three people do not have access to improved **sanitation** facilities.
2. Next, as a group, think about any specific need your community, or even your city, might have regarding **sanitation** and explain that you will be writing a letter to your local government representative in order to encourage him or her to address this issue. Encourage your group to use a persuasive language and to include useful facts.
3. Have everyone sign the letter and send it!

Discussion

Why is it important that community members participate in the improvement and construction of a better society?

Have you ever been to a place where there were no clean or sufficient **sanitation** facilities? How did you feel? How do you think this affects the lives of the people who must suffer because of this every day?

Why would you say the right to clean water and **sanitation** are essential to the realization of all **human rights**?

Be a Water Reporter!

Level 2 3

Aim

To learn about the main causes of insufficient or unsafe water.

Materials

Computer with internet access, video cameras (a digital camera or a mobile phone with a camera could work if you do not have access to a video camera), *the groups might need some additional materials.

Time

Two one hour lessons (one hour to begin the activity and one hour to present their works); this activity might require some extra work at home (or, if you prefer, you could assigns some time during the lessons).

Background

There are great differences in water availability from region to region -from the extremes of deserts to tropical forests. We all need water, but we all have to share the limited amount of **freshwater** we have in our world. In many regions, demand is increasing as a result of population growth and other demographic changes (in particular **urbanization**) and agricultural and industrial expansion following changes in consumption and production patterns. In addition to problems of water quantity there are also problems of water quality. **Pollution** of water sources is posing major problems for water users as well as for maintaining our natural **ecosystems**. Moreover, in many regions, the availability of water in both quantity and quality is being severely affected by **climate** variability and **climate change**, with more or less **precipitation** in different regions and more extreme **weather** events.

People all around the world need access to safe and sufficient water, but inadequate supply has become a major concern. Developing and developed countries are looking for new solutions that allow them to address the ever increasing demands from demographic, economic and climatic pressures; therefore, **wastewater** treatment, water recycling and improved demand management measures are being introduced to counter the challenges of water supply and access.

How to do it

1. Discuss with your group about water access and availability around the world, and review each one of these major causes of insufficient or unsafe water:
   - *Population* - increased consumption
   - *Urbanization* - exploding urban population growth
   - *Pollution* - from everyday activities (homes, businesses, factories, etc.)
   - *Climate change* - increased **weather** related disasters
   - *Poor management* - working toward improved distribution and wise and sustainable use of water
2. Remind your group how different topics are presented through videos or voice recordings. Explain to them that they are going to become water-reporters and that they will make their own videos about the issues affecting water access.
3. Divide the participants into five teams and assign one of the above major causes of insufficient water to each one.

4. Give them time to organize themselves at school or youth group, but this activity might need some extra work at home. They can use the internet or some books to look for more information; the *UN International Decade for Action 'Water for Life'* web page contains some useful information:

   www.un.org/waterforlifedecade/index.shtml

5. When they are ready, have each group present their work and why not send the best ones to a local TV station!

Discussion

Which video did you enjoy the most? Why?
Do you think people in your community are aware of the importance of water access and availability?
How might you help others to understand the importance of this?

Useful resources

National Drought Mitigation Centre
http://drought.unl.edu/DroughtforKids.aspx

National Environmental Education Week
http://eeweek.org/resources/index.htm

Penn State College of Agricultural Sciences, Water Lesson Plans
http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water

The Groundwater Foundation Kids Corner
www.groundwater.org/kc/kc.html

United States Environmental Protection Agency, A Student's Guide to Global Climate Change,
www.epa.gov/climatechange/students/index.html

Water Pollution Guide
www.water-pollution.org.uk

Water for a Better World

Introduction

Have you ever thought how your life would change if you didn't have access to sufficient and clean water? Well, this is an everyday issue for almost 780 million people on our planet who lack access to an improved water source. Moreover, 2.5 billion people live in areas without proper hygienic **sanitation**. Together these two statistics translate into the deaths of 3.41 million people each year from water, **sanitation** and **hygiene**-related causes. When people don't have a sufficient and continuous water supply for personal and domestic use, all aspects of their lives are affected: health, growth, education, work, among others.

On 2010, the United Nations General Assembly recognized the human right to water and **sanitation** and acknowledged that clean drinking water and **sanitation** are essential to the realization of all other **human rights**. Water and development are closely linked; water is crucial for **poverty** reduction, for **food security** and for sustainable growth. In addition, experts have found that investing in water –through improved water resources management and water supply and **sanitation**- contributes significantly to increased production and productivity within economic sectors.

Declining water quality and availability has become a global concern as human populations grow, industrial and agricultural activities expand, and **climate change** threatens to affect our water resources. Poor water quality has a direct impact on water quantity as polluted water reduces the amount of useable water within a given area. The issue of water protection and conservation is not just about 'saving' water, it is about having enough clean water at any given time and place to satisfy our needs. We cannot afford to take our water resources for granted, we all share the responsibility of using our water wisely and, without doubt, we can start at home and in our community!

Activities

Water is Poetry

Level 1 2

Aim

To reflect about water and its connection to health and happiness.

Materials

Paper, pencils.

Time

One hour.

How to do it

1. Ask your group to think about water and how cool it is, we need water for almost everything we do each day. Tell them to think about adjectives to qualify water and write them on the board.
2. Either individually, or as a group, ask the participants to read the following water-inspired poem:

Water is a Lovely Thing

Julia W. Wolfe

Water is a lovely thing—
Dark and ripply in a spring,
Dark and quiet in a pool,
In a puddle brown and cool;
In the river blue and gray,
In a raindrop silver gray,
In a fountain crystal bright;
In a pitcher frosty cold,
In a bubble pink and gold;
In a happy summer sea
Just as green as green can be;
In a rainbow far unfurled,
Every colour in the world;
All the year from spring to spring,
Water is a lovely thing.

Source: Water Partners International, Global Water Supply, Elementary School Curriculum, http://static.water.org/pdfs/WPElemCurricFULL.pdf

3. Next, explain that each participant will create a poem about water; ask some questions that might help them to reflect about water and its many benefits. How do

we use water? Does everyone have access to clean water? How would your life be different if you didn't have water? Why do we need to care about water?

Give the participants enough time to write their poems, tell them to read the words on the board for inspiration. If the participants have trouble creating a poem they may want to try writing the word 'water' and assigning an adjective for each letter of the word.

4. Ask each participant to share his or her poem.

Discussion

What did you want to transmit through your poem?
Why do we say water is a precious resource?
Why do all living beings need water?

Water is Not Always Available

Level 1 2

Aim

To demonstrate the concept of clean water availability and water conservation.

Materials

An outdoor setting, three sheets of paper per group.

Time

30 minutes.

Background

Less than 1 percent of all the water on the planet can be used by people, the rest is salt water (from the oceans) or is permanently frozen and we can't use it. We use water every day, but unfortunately water is not easily available in many parts of the world.

In some places even if communities have water pipes and taps, water is supplied only for a few hours a day, in others places people have to store their water supply from the village well, a community tap or hand pump. And still in other cases women and children have to walk various kilometres each day to haul water. About 780 million people lack access to clean water. As the population grows, more and more people need to use this limited resource. Therefore, learning how to care for it is very important.

How to do it

1. Explain to your group that you are going to challenge them to find clean water and transport it to a location where it can be used.
2. Group the participants into teams of at least six. Place one member, the Tribe Leader, on the opposite side of the activity area from their team. The Tribe Leader must get clean water for his/her family. The remaining team members are drops of clean drinking water from a local river.
3. Provide three sheets of paper to the Tribe Leader; these are stepping stones for carrying the drops of water, make sure you place each of them about a metre away. Both the 'drops' and the 'leader' must step on these to get from the river to the village. At no point can any team member touch the floor without contact with the paper. If they do, 'water has been spilled, and the member/drop must go to the back of the line and try again, delaying the process of carrying a full 'container' of water across the area.

4. **Challenge:** instruct students that their 'container' has now sprung a leak; for every two (or three) drops brought to the village, not including the leader, one drop must be brought back.
5. The first team to transport the most 'drops of water' to their 'village' in the shortest period of time is the winner.

Discussion

How do you get your water at home?
Which difficulties did you have carrying your water back to your families? How can this relate to the reality of many people in **developing countries**?
How would you feel if you had to do this every day to get some **freshwater**?

Source: $H_2OH!$, Activities, Bringing Water Home,
www.watercan.com/h2oh/1-3.shtml

What Has Changed?

Level 1 2 3

Aim

To discover how water sources have changed on local neighborhoods.

Materials

Notebooks, pencils.

Time

A 30 minutes lesson to explain and prepare the activity and another 40 minutes lesson to review the outcomes.

How to do it

1. Explain to your group that they will transform themselves into water detectives and that they will be in charge of discovering how different water bodies or water sources have changed over time.
2. Tell the participants that their homework will consist of interviewing an elder member of his/her family or community to learn about their perspective and the changes they have seen over their lifetimes regarding water availability, use and consumption. For example, perhaps water used to be plentiful but now it is **scarce**, water is now polluted, rain patterns have changed, or streams are not as plentiful.
3. Support your group to develop a set of questions to pose in the interviews and help them consider all aspects of community life that could be affected by a lack of safe and sufficient water.
4. Ask them to present their interviews in a fun way, maybe a diary entry, a letter or a short story.
5. Have each participant read share their work.

Discussion

What do you think is the most serious change your community has experienced?
How have the changes affected the demand for and the quality of water?
How may the decisions being made today have an impact on the **environment** in the future?
What do people see as the key challenges of water conservation?
What can you do or avoid doing to help protect water in your neighborhood?

Needs and Wants and Human Rights

Level 1 2

Aim

To discuss about the difference between 'needs' and 'wants'.

Materials

'Needs' and 'wants' cards.

Time

30 minutes.

How to do it

1. Ask the participants what they think the difference is between a 'need' and a 'want'. Write up agreed definitions of each. Could a want be considered a luxury or is it different?
2. In pairs or small groups, ask the participants to sort through the 'needs' and 'wants' cards. Make two piles - one pile should represent needs and one pile should represent wants.
3. Go through the cards as a group and discuss any disagreements. Ask whether needs and wants might change depending on where you live. Why might this be the case? Ask the participants to give examples.
4. Have the participants look back at their needs and wants cards. In their pairs or groups they should agree on their top five needs and the reasons for their choice. As a group, the top five choices should be discussed. Has anyone changed their mind? What are the top five needs as a class? Why are these things so important?
5. Explain that many of these needs are considered to be so important that they are seen as 'rights'. Discuss what is meant by a right. Why do people need rights? Are children's rights different to those of adults? Why might this be the case? Which rights might be different for a child?

Discussion

In which countries would you be most likely to satisfy your 'wants'? Why could that be?
Why do you think the United Nations declared safe, clean drinking water and **sanitation** as a human right?
What happens to people that do not have access to clean water and **sanitation** services? How do you think their life is different from yours?

Source: Water Aid, lesson plans, Secondary,
www.wateraid.org/documents/secondary_lesson_plans_human_rights_and_sanitation_250310.pdf

'Needs' and 'Wants' Cards

Food	Water
Bed	Winter Coat
House	Entertainment
Sports Facilities	Shower
Bath	Transport
Hospital	Internet
Phone	Toilet facilities
Books	School

Water Wise Pipes and Puddles

Level 1 2

Aim

To reflect about what it means to be water wise.

Materials

100cm x 100cm piece of poster board, colour pencils, ruler, markers and dice.

Time

One hour.

Background

You might wonder why there is so much difference in water availability, some reasons are natural. Some parts of the world get little or irregular rainfall (it might happen that rain does not come for two or three years). This means there is no water to fill up the different bodies of water. No rain means no water for domestic use and for agriculture; therefore, it is not possible to grow food. This situation is called **drought**.

In some parts it rains for a short period of time; it rains heavily and often all the rain water flows away before it can be stored and used. This can happen especially where there is not enough vegetation to cover the soil. It is the roots of the plants, trees and grass that make soil softer. Land with a lot of plants growing on it will hold water longer and release it slowly. In other places even if lakes and ponds are filled up with rain water, this is being used faster every time.

Population growth means more and more people need water. But, people are using our water from its natural stocks faster than it takes nature to replenish it. Human beings are digging very deep to extract the underground water that has been collecting for thousands of years.

Source: United Nations Environment Programme, Tunza, A Trip With Drip, http://unep.org/tunza/children/images/flash/a_trip_with_drip/start.swf

How to do it

1. Take a 100cm x 100cm piece of poster board and divide it into a 10 x 10 grid of squares. Number the squares starting from the bottom left square as 1 and going backwards and forwards up the board to the top left square.
2. Draw ten water puddles in the following squares: 13, 16, 35, 46, 51, 60, 65, 72, 81, 87. If you land on a puddle, you must go back, so write one of the following ideas on each puddle starting from square n.13:
   - You left your faucet leaking, back to Start!
   - You took a large bath, instead of a short shower, back to 9!
   - You saw an ice-cream wrap on the street and you didn't pick it up, so now it has been washed into the drain pipe, back to 25!
   - You washed your dad's car using the hosepipe, back to 32!
   - You used the washing machine for half a load, back to 40!
   - Your farm is using too many fertilizers that are being carried in storm water runoff and are negatively affecting your water supply, back to 48!
   - You used a hosepipe to clean your driveway, back to 53!
   - You wasted water while washing the dishes, back to 64!
   - You threw some old oil down the drain pipe, 73!
   - You left the tap running while brushing your teeth, back to 77!
3. Draw eight water pipes which connect different squares to each other. If you land on a pipe, you must go up the pipe!
4. On the following ten squares, 3, 11, 23, 30, 45, 59, 66, 78, 84, 91 write the following instructions:
   - You respect water, move to 10!
   - You washed your dirty hands, move to 26!
   - You recycle your rubbish, move to 38!
   - Your backyard is full of plants that help retain water, move to 49!
   - You watered your garden in the late afternoon, move to 55!
   - You asked your parents to fix a leaking tap, move to 68!
   - The water bill was paid by your parents, move to 79!
   - Thanks to you, your community is using water barrels to collect rain water and people are using it for different activities, move to 85!
   - You taught your little sister how and when to wash her hands, move to 90!
   - You convinced your mom to use non toxic house hold products, move to 97!

   Ask your group to help you make it look colourful and fun!
5. On the last square, 100, write: You are the water wise winner!
6. Explain the game. You will need one marker for each player and a dice. Roll the dice and move the marker the number of spaces you got on the dice. If you land on a pipe, you can go up the pipe if you give a reason how water contributes to maintaining a good health. If you land on a puddle, you must go back. The first to reach the space

100 is the winner! Have fun!

Discussion

How do our everyday activities affect water quality?
What could be the consequences of not having enough water to satisfy our daily needs?
If you know that everyone has the right to enjoy clean and fresh water, what can you do to help people that don't?

Adapted from: Water Wise, Be Water Wise, Pipes and Puddles,
www.waterwise.co.za/export/sites/water-wise/fun/Pipes_and_Puddles.pdf

No Running Water At Home!

Level 1 2

Aim

To realize how difficult life would be if you and your family did not have water access.

Materials

Notebook, pencil.

Time

A ten minutes lesson to explain the homework and another 30 minutes lesson to review the outcomes.

Background

Less than 1 percent of all the water on the planet can be used by people, the rest is salt water (from the oceans) or is permanently frozen and we can't use it. We use water every day, but unfortunately water is not easily available in many parts of the world.

In some places even if communities have water pipes and taps, water is supplied only for a few hours a day, in others places people have to store their water supply from the village well, a community tap or hand pump. And still in other cases women and children have to walk various kilometres each day to haul water. About 780 million people lack access to clean water. As the population grows, more and more people need to use this limited resource. Therefore, learning how to care for it is essential.

How to do it

1. Explain to your group that you are giving them a homework which will help them and their families to realize how fortunate they are to have access to sufficient and clean water, and how it is so important to save this precious resource.
2. Ask the participants to list as many uses for water as they can together with their families. Tell them to decide on their families' top five uses of water.
3. Tell the participants they must then talk to their families about people living in **developing countries** that do not have toilets, washing machines, dishwashers or any running water in their homes. Ask them to discuss with their families how they think people without access to running water use water differently from their families.
4. Next, tell the participants to pretend with their families that starting from the next day they will no longer have running water at home. Their families will only be able to get water from a well that is located two miles away from their homes. They will have to walk to and from the well to collect their water. Ask the participants to plan how their families will work together to bring the needed amount of water to their homes.

Tell them to assign a role to each member of the family.

Family member: …… Duties: ……

Things to consider:

The family will need 57 litres of water each day. What container size should the family use? How much will these containers weigh? Does the family have younger siblings? Is everyone in the family capable of making the trip?

5. Make sure the participants reach some general conclusions with their families so they can share some ideas at school or youth group.

Discussion

What are the main water uses of your family? Where and when do you use water the most?
Do you think you and your family need to be more water conscious?
How would you and your family feel if you had to walk everyday to look for some water?
Who would be in charge of collecting the water?
How would this affect your current everyday activities? Do you think this would affect your future?

Adapted from: Water Partners International, Global Water Supply, Elementary School Curriculum, "Water Has many Uses" Family Questionnaire,
http://static.water.org/pdfs/WPElemCurricFULL.pdf

The Great Water Grab

Level 2 3

Aim

To discuss about water use and water rights.

Materials

Paper, pencils, scissors, hat, masking tape, clean bucket or large bowl, measuring cup (two cups), eight bowls, salt, pepper, parsley.

Time

40 minutes.

How to do it

1. Remind your group how the amount of water in a river changes from season to season and from year to year depending on rainfall, snowmelt, etc. So what happens when there is too little water in the river to fulfill the water rights of everyone that holds them? Explain to your group that in this exercise they will be representing holders of water rights and that they will take their allocations from a fictional river. Four circumstances will be explored, including **drought**, water quality degradation, and beneficial use.
2. Write the following water interests on eight scraps of paper:
   - City – 15 maf
   - Mine – 10 maf
   - Ranch – 15 maf
   - Power Plant – 10 maf

- Lettuce Farm – 20 maf
- Environmental Trust – 5 maf
- Battery Manufacturer – 15 maf
- New Housing Development – 10 maf

(***Note:*** Environmental trusts purchase water rights for the purpose of keeping water in its basin, for the benefit of fish and wildlife. 'Maf' is short for millions of acre-feet per year, one of the ways in which water rights are measured).

3. Place a piece of masking tape on the floor, approximately 3 metres long. The tape signifies a fictitious river. Eight participants will position themselves along the tape.
4. Ask each of the eight participants to draw one folded scrap of paper from a hat. The paper they choose will specify who they represent and how many million acre-feet (maf) of water they have been allocated from the river.
5. Refill the hat with eight new scraps of paper, numbered 1-8. Have each participant draw a number from the hat. The numbers dictate seniority of water rights, with one being the most senior right and eight being the most junior.

Trial Run A: Allocations

6. The river, designated by the tape, is flowing at 100 million acre-feet per year. Place ten cups of water in the bucket. One cup of water = 10 maf.
7. Give the water bucket to the participant with the most senior water right. Using a measuring cup, he or she must take from the bucket the number of acre-feet his or her water right gives him or her and put it in his or her bowl.
8. The participant then hands the bucket to the person holding the second most senior water right, who draws from it the amount allocated to him or her by his or her water right. This procedure continues until all eight participants have withdrawn their water allocation from the bucket.

Trial Run B: Drought Year

9. Repeat steps three to eight with a new set of volunteers. This trial run represents a **drought** year. Only 75 million acre-feet of water flows through the river that year, so begin the exercise with only 7.5 cups of water in the bucket.
10. Who did not receive his or her allocation? Should his or her use of the water take priority over someone else's use? Why?

Trial Run C: Water Quality

11. This trial run deals with water quality. Repeat steps three, four, and six. Pass the bucket from one end of the tape to the other. Each participant will take their allocation, but return part of it to the bucket mixed with salt if their usage results in increased salt levels, pepper if their usage leads to increased heavy metal levels, and parsley if their usage results in oxygen depravation. (***Note:*** water from power plants and some industries is returned to the basin heated, which leads to decreased levels of dissolved oxygen).
12. Have each participant discuss how the quality of the water he or she receives might affect his or her usage of it. Is the water they return to the bowl degraded in quality? How do downstream users feel about the upstream users?

Trial Run D: Beneficial Use

13. Repeat steps three to eight with a new set of volunteers. Each time a participant draws his or her water allocation from the bucket, he or she must pretend to drink once from their cup and return whatever is left to the bucket. They must then answer the question, 'Are you wasting water by not consuming all of it?'

Discussion

Who has the right to use water? Does this right mean water can be wasted or used unsustainably?
Why do you think conflicts related to water arise between people, communities and nations?
Who do you think must work together to decide about water use and conservation? What can you do?

Source: Ecology Center, Social Studies, Terrain for Schools Guide
www.ecologycenter.org/tfs/pdf/2002summer/whoownswater.pdf

Vegetation & Water Protection

Level 1 2 3

Aim

To learn how vegetation slows soil erosion and protects against sedimentation.

Materials

Two shoe boxes, two plastic trash bags large enough to line the boxes, watering can, two medium-sized clear jars, two blocks of wood or bricks about the same thickness (books will also work, but they might get wet), one piece of sod cut to fit in one box, loose soil from near where the sod was dug, a small table, measuring cup.

Time

40 minutes.

Background

The roots of trees and vegetation help anchor the soil. When trees are cut down and vegetation is cleared there is no longer anything to protect the ground, and soils are quickly washed away with rain.

As soil is washed down into rivers, lakes and streams it causes problems for aquatic life and people. When soil ends up in different water bodies it is called sediment. This soil is floating around in the water and sinking to the bottom. Animals like fish suffer because water becomes clouded and spawning grounds fill with silt, while people have trouble navigating waterways that are shallower because of the increased amount of dirt in the water. Moreover, farmers lose topsoil that is needed for growing crops.

How to do it

1. Explain to your group that you will conduct an experiment to determine how vegetation helps prevent erosion and sedimentation.
2. Cut a V-shaped notch in one end of each box so that the point of the V reaches just to the bottom of the box. Line each box with a plastic bag that extends over the sides of the box and over the V.
3. Place the sod, grass-side up, in one box. Place the soil in the other box in a gently packed down layer about as thick as the sod. The soil should have no grass or other

vegetation growing in it.

4. Set the boxes on the table and place a block of wood or other object under the uncut end of each box so that they are tilted slightly down toward the end of the box with the notch. Place each box so that the end with the notch is slightly over the edge of the table. Place a jar under each notch to catch water.
5. Fill the watering can with three cups of water. Pour water near the back of one box (farthest from the V). Time how long it takes for this water to reach the jar. Now repeat the process with the next box and jar. Pour again from the same height and at approximately the same rate. Watch what happens to the water in each box and the appearance of the water collected in the jars.

Discussion

How much water came out of the bare soil versus the soil with grass? Which was clearer? Did the water exit each box at the same rate? Which was faster? Can you explain why? What is the role of vegetation in the **water cycle**?
If you were a fish, would you rather live in a stream where the **watershed** was covered with grass and other vegetation or where the soil was bare? Why?

Source: Water Quality Matters, 4-H Water Project, Unit 3, Settling Sediment and Stream Bank Vegetation, page 12.

How Does Pollution Affect Nature?

Level 1 2 3

Aim

To study the effects of pollutants on plant growth.

Materials

Lima beans (these should be pre-soaked), plastic sandwich bags, paper towels, marker, solutions: water, vinegar, salt, liquid soap.

Time

A one hour lesson (to prepare the experiment), five ten minutes lessons (to make the seed observations) and a last 30 minutes lesson (to have a group discussion).

How to do it

1. Ask your group where plants get the water they use to grow from (rain, **groundwater**, irrigation) and how plant growth would be affected by polluted water.
2. Prepare 30ml of each solution: clean water (control), vinegar, salt water and soapy water.
3. Tell your group the context of the experiment: a local chemical company has been dumping waste into their back fields and it has been leaching into a local **groundwater** source. Local scientists (your group) have been asked to study the long-term effects of this **pollution** on local crops (lima beans). Participants will compare seed growth in four different solutions (water, vinegar, salt, and soap). The water represents **freshwater**, the vinegar represents acidic rain, the salt solution represents saltwater, and finally, the soap represents chemical spills into **freshwater** supplies (from residential and factory sources).
4. Divide the participants into lab groups (preferably groups of four). Each group must receive four lima beans, four sandwich bags and four pieces of paper

towel.

5. Ask each group to label each bag, one for each liquid. Participants must soak one paper towel in each liquid and place it in the corresponding bag. They must then add 10 ml of the corresponding liquid into each bag. One lima bean should be placed at the top of each paper towel and the bag must be sealed. Tell each group to make a hole at the top of each bag as the seeds will need oxygen to grow. Ask them to put all their experiments in the same place in the classroom or meeting room for observation over the next seven days.
6. In the interim, have each group organize their 'scientific notes':
   - Purpose
   - Hypothesis
   - Materials
   - Procedure
   - Observations

Day	Fresh Water	Salt Water	Acid Rain	Wastewater
Day 1				
Day 2				
Day 3				

   - Results and Conclusions.

7. On a daily basis, ask each group to record their observations through drawings, descriptions and measurements of seed or root growth.
8. Each group must complete their scientific report by outlining the best **environment** for plant growth based on their findings. In their conclusions, they should make recommendations to the industry in order to save the local crops; make sure they support their statements with their results.

   * **As an extension activity**, you could have the elder groups write a law for your country's legislative authority (Congress, National Assembly) to consider, that would penalize companies that introduce toxic waste into any ground or **surface water**. The participants should include justifications, provisions and penalties.

9. Have each group present their results and conclusions to the rest of the participants.

Discussion

Did all the seeds grow? Why or why not?
Which seeds grew at the beginning and which at the end of the experiment? Why did some seeds stop growing?
How would polluted water affect the world's food supply?

Source: H₂oh!, Activities, How does pollution affect nature?
www.watercan.com/h2oh/2-1.shtml

Watershed and Water Expert

Level 1 2 3

Aim

To learn about the actions that are being taken at a local level to maintain a healthy **watershed** and how this is related to water quality.

Materials

Notebooks, pencils.

Time

A ten minutes session to explain the activity and to prepare some questions for the government representative's visit, and a one hour session to receive him or her.

How to do it

1. Invite a local government representative, from the Ministry of the Environment for example, to your school or youth group, so he or she can talk about the initiatives that are being implemented to maintain a healthy **watershed** and prevent water **pollution** in order to guarantee a supply of clean and safe water to the community.
2. Before that day, make sure you encourage your group to think about the things they might want to know and help them prepare some questions.

Discussion

How are **biodiversity** and water related? Why is it important to protect your **watershed**?
How can we balance the needs of people, protect the **environment** and have a good economy?
How can you make your everyday activities more sustainable?

Ocean Acidification Documentary

Level 2 3

Aim

To gain a deeper understanding about ocean acidification.

Materials

Notebook, pencils, whiteboard, whiteboard markers, internet access.

Time

40 minutes.

How to do it

1. Tell your group that you are going to watch a documentary about ocean acidification:

   Acid Test: The Global Challenge of Ocean Acidification,
   www.oceanacidification.net/go-deeper/

2. Ask them to write down some key words about the documentary while they watch the video.

3. Once the video is finished, have your group brainstorm their main ideas and make a list on the whiteboard. Use the list to encourage discussion.

Discussion

What are the causes of ocean acidification?
What could be the consequences for the **environment** and for human beings?
What are some things you can do to prevent this?

Healthy Habits, Healthy People

Level 1 2

Aim

To link water and **sanitation** to health.

Materials

A playing area, whiteboard, whiteboard markers.

Time

40 minutes.

Background

Germs are infectious agents that can make you sick. You can find them anywhere in the world. Types of infectious agents include: bacteria (tiny single-celled **organisms**), fungi, viruses and parasites (protozoa and worms). Some of these can be harmful to humans while others are beneficial. For example, some bacteria help our body's immune system to fight disease causing germs. When disease-causing germs invade your body and your immune system can't fight them, they multiply and gain strength. Germs take **nutrients** and energy from your body and can produce toxins (chemicals that damage cells). Your body reacts to the toxins creating symptoms (evidence or signs) of illness. Different diseases can cause different symptoms. However, different diseases can also share the same symptoms.

In order to prevent getting infected by a disease, we must first understand how it is spread. Common ways in which diseases are spread include:

- Droplet contact - inhaling or other contact with droplets coughed or sneezed by an infected person.
- Direct physical contact - touching an infected person or infected bodily fluids.
- Indirect contact - touching a contaminated surface.
- Airborne transmission - breathing in contaminated dust particles or airborne germs that can remain alive in air for long periods of time.
- Fecal-oral transmission - consuming contaminated food or water, and from indirect contact that spreads germs from feces.
- Vector transmission - transmission of a disease from an animal, such as from mosquitoes.

Practicing the following healthy habits helps to prevent the spread of diseases:

- Wash your hands frequently with soap and clean water, especially before or after certain activities (e.g., before preparing food and after using the bathroom).
- Cover your mouth with your elbow when you cough or sneeze.
- Purify all your household drinking water (unless you know t is safe to drink water

directly from the faucet).
- Remove stagnant water from around your house.

How to do it

1. Ask the participants to name diseases they are familiar with and list them on the board. Next ask students what causes diseases (diseases are caused by germs). Emphasize that there are both harmful and beneficial germs. Discuss the fact that one disease-causing germ will probably not make you ill, but once these germs multiply in your body, you can experience symptoms of the disease.
2. To get the participants thinking about how germs are spread, act out each action in the list below and have the group guess how the germs are spread.
   - sneezing (droplet contact) - inhaling or other contact with droplets coughed or sneezed by an infected person.
   - shake a friend's hand (direct contact) - touching an infected person or infected bodily fluids.
   - touch the doorknob or a desk (indirect contact) - touching a contaminated surface.
   - breath in air then feign sickness (airborne) - breathing in contaminated dust particles or airborne germs that can remain alive in air for long periods of time.
   - eat food and drink water (fecal-oral transmission) - consuming contaminated food or water, and from indirect contact that spreads germs from feces.
   - pretend to get bit by a mosquito - transmission of a disease from an animal, such as from mosquitoes.

   After each action, write the method on the board and explain the process behind the transmission of germs.
3. Next, have the participants think who are more affected by diseases -poor people, children, the elderly. Why is this? Consider the following facts:
   - Every 20 seconds, a child dies from a water-related illness.
   - Half of the hospital beds in the world are occupied by patients suffering from diseases associated with lack of access to safe drinking water, inadequate **sanitation** and poor **hygiene**.
   - It is estimated that nearly 10 percent of the global disease burden could be reduced through improved water supply, **sanitation**, **hygiene**, and water resource management.
   - Diarrhea is more prevalent throughout the developing world largely due to the lower levels of access to safe drinking water and **sanitation**, along with poorer overall health, **hygiene**, and nutritional status.
   - 90 percent of the deaths due to diarrheal diseases are children under five years old, mostly in **developing countries**.

   Source: Water.org, Water facts, Disease, water.org/water-crisis/water-facts/disease/
4. Explain that you are playing a **'Healthy Habits'** tag to simulate how a disease is transmitted through a community and how using healthy habits can prevent transmission.
5. Ask for two volunteers to be 'it.' Bring these participants to the front of the game

area. Explain that these participants will be germs of a disease ready to infect other people.

6. Ask for three more volunteers. Bring all of these volunteers to the front of the game area, next to the participants who have been identified as the 'disease-causing germs.'
7. Explain to the group that the three new volunteers represent healthy habits which prevent becoming infected by a disease. Each of the three students will be given a different role. Each role represents a healthy habit supporting the body's immune system. Each of these students must be tagged three times before becoming 'ill.' Assign roles to the volunteers using the healthy habits listed below or create your own healthy habits for this activity.
   - Role 1: you washed your hands with soap and water after using the bathroom.
   - Role 2: your family properly stored all the water in clean, covered containers.
   - Role 3: your family purified all the water they consume in the house.
8. Explain to the group that if someone is tagged by the participant who represents 'it' (a disease-causing germ), he or she must leave the playing area and go to the hospital. Designate and area as the hospital.
9. Explain to the group that if a participant touches a healthy habit volunteer before getting tagged by a 'disease-causing germ,' then he or she has immunity for one touch. If a participant has touched all three 'healthy habits' then he or she has immunity from the 'disease-causing germs' for three tags (the same as the immunity level of the healthy habits themselves).

   Note: this game may be played with different colour stickers. 'The disease' carries red stickers and infects students by placing red stickers on them. The 'healthy habits' carry yellow, blue and green stickers and give students immunity with their healthy habits stickers. This allows students and diseases to keep track of the number of tags and immunities.

10. Ask the participants to raise their hands if they did not become sick after the first time they were tagged. Repeat the question asking students to raise their hands if they did not become sick after the second and third times they were tagged. Ask students who went to the hospital how it felt to sit down while their friends continued to play. (They will likely respond it was not fun. Remind them that being ill is not fun either!)
11. Finally, have students identify healthy habits that help support the body's immune system.

Discussion

How does having clean water and **sanitation** facilities help you stay healthy?
Why are water borne diseases more common in poor areas?
What does this phrase mean? 'What you do on the outside can keep you healthy on the inside.'

Adapted from: Project WET and UN Water, Healthy Water, Healthy Habits, Healthy People, www.projectwet.org/pdfs/WASH/LAC_EdGuide_EN.pdf

Water and Human Health

Level 2 3

Aim

To reflect how access to water affects our lives.

Materials

Papers, pencils, internet access (optional).

Time

Two 40 minutes session, one to explain the activity and to give the groups some time to brainstorm and research some additional information, and the other to allow them to write the article.

Background

780 million people in the world do not have access to safe drinking water and 2.5 billion lack access to basic **sanitation**. More than 3.4 million people die each year from water, **sanitation**, and **hygiene**-related causes. Nearly all deaths, 99 percent, occur in the developing world. Moreover, every 20 seconds, a child dies from a water-related illness.

We all need clean water, water is essential for life. This is why everyone must help save water and promote water access for all. Water changes lives!

Source: Water.org, Water Facts,
http://water.org/water-crisis/water-facts/water/

How to do it

1. Divide the participants into two groups. Explain to them that each group will have to write a newspaper article about water availability and human health. Remind them that if they need further information they can look on the internet or in the library. Tell them they will have to present their work as a newspaper article in order to inform others in the community about this issue.
2. On a future session give the groups enough time to write their articles. Ask each group to present their work to the rest of the participants.
3. Then, you can publish the articles in your school, youth group or library. You can even send the articles to the local media!

Discussion

Has your community been affected by water issues? How?
Why is it important to inform others about water related issues?
How could your community contribute to help others overcome **water scarcity**?

Do You Agree or Disagree?

Level 2 3

Aim

To understand why people are affected differently by water vulnerability.

Materials

Whiteboard, agree-disagree sings, adhesive tape.

Time

One hour.

How to do it

1. Draw a horizontal line on the whiteboard. On the left-hand side paste the *'I disagree'* sign and on the right-hand side paste the *'I agree'* sign.
2. Explain to the participants that you are going to read a statement and that each individual should make a drawing of him or herself along the line according to their belief. If they strongly agree with the statement they should make their drawing at the right-hand side of the line and if they do not agree they should draw themselves at the left-hand side. They can draw themselves on the extreme ends of the line or anywhere along its length, depending on how strongly they agree or disagree with the statement.
3. Every time you read a statement, give the participants a short time to think quietly to themselves about how they feel. When everyone has made their drawing, pair each participant with another one that has a differing opinion from theirs. (If there are no differing opinions, ask some participants to explain why they have chosen that position).
4. Have these pairs present their opinions, each taking turns listening to the other.
5. After debating each statement with the participants, give them an opportunity to amend their position on the line if they feel their opinion has changed.

Statement ideas:

- Being poor means natural disasters will affect you more.

  Note: people who live in **poverty** often do not have the resources to protect themselves from natural disasters such as **floods** and **droughts**. This might include lack of access to strong building materials to build **flood** resistant homes, or lack of access to equipment and expertise to extract water from the ground. People who live in a poorer country are less likely to benefit from insurance or good emergency services.

- Being poor means you are more likely to experience problems related to water.

  Note: vulnerable people are more likely to rely on their local natural resource base. The food a subsistence farmer grows requires water, so **drought** has serious consequences. Lots of poorer countries do not have a good (or any) water infrastructure (i.e. pipes, taps, running water) which results in significant time spent fetching water by hand. You may rely on rivers or lakes to access water which may not always be clean, this can lead to getting water-borne diseases.

- Women and girls are more likely to experience problems to do with water than boys and men.

  Note: often women and girls are the ones who must spend time collecting water, taking time out of their day, sometimes not leaving them time to go to school or to work on some more productive activities. In this case, water issues can affect the long term opportunities of girls especially. Women are also more likely to be subsistence farmers than men, and therefore rely on the right **weather** to grow food and rear healthy animals.

- **Climate change** is resulting in people experiencing more and more water related problems.

  Note: **climate** has a significant impact on water vulnerability. This is both in terms of availability of water on a wider scale, and frequency of events such as **floods** and **droughts**. The **climate** is changing and becoming more unpredictable, this makes planning and managing access to water very difficult.

- Living in a city means you won't experience any water related problems.

  Note: this is a tricky statement to make any definite comments about, although where people live obviously affects how water vulnerable they are. People who live in a rural area are less likely to benefit from good water infrastructure, although this is not always the case. In cities there can also be huge problems in terms of lack of access to adequate water and **sanitation**, particularly in overcrowded areas. One possible difference between urban and rural is that people who live in a rural area are more likely to depend on water to grow food, so a lack of water will impact on their food supply.

- Governments have the power to stop water related problems.

  Note: government spending, or lack of it, has a significant effect on water vulnerability. This is particularly the case in terms of investment in water infrastructure, and dealing with emergency situations. Governments in **developing countries** might not be able to invest money in water infrastructure, as they have to spend a lot of money on paying back debt to rich countries from years ago.

- People who live in conflict areas are more likely to experience water related problems.

  Note: often, conflict can have negative effects on water vulnerability. If fighting forces people to flee from their homes, it can be difficult for them to access water. People may have to live in a displacement camp, meaning that their access to water and **sanitation** is dependent on what is available in the camp. A country's water infrastructure may be destroyed, setting a country further back than it initially was, even long after the end of a conflict (e.g. Liberia).

- The younger you are the more likely you are to have problems related to water.

  Note: the young and old are especially vulnerable to water borne diseases. In countries

where the water infrastructure is not good, often children (especially girls) have to miss school to go and collect water.

* *You could think about more statements that are related to some local issues!*

Discussion

Why is water such an important issue?
How does water vulnerability affect the opportunities of people to have a successful future?
Which regions have the biggest lack of clean drinking water and improved **sanitation** facilities? Can you do something about it?

Source: Oxfam, Oxfam Water Week, Opinion Line – Who is Water Vulnerable?
www.oxfam.org.uk/~/media/Files/Education/Resources/Water%20week%20learn%20primary/Water%20vulnerability%20game.ashx

Water-Aware Facts

Level 2 3

Aim

To learn about different water related facts.

Materials

Paper, pencils, scissors.

Time

One hour.

Background

No living being on Earth can survive without water. Water is essential for human health and well-being as it allows us to meet basic human needs such as drinking water and **sanitation** services. Water is also necessary to grow food and to manufacture all kinds of products. But, beyond human uses, water is also critical for the preservation of the **environment** and its living creatures. Water nurtures our landscapes and provides **habitat** for wildlife. Currently, scientists have come to appreciate to a higher extent the valuable services provided by water-related **ecosystems**, from **flood** control to storm protection and water purification.

Water is one of our world's most valuable resources, but it is also one of the **scarcest**. Some parts of the world have better access to clean, easily attainable water than others. In some places obtaining water is as easy as turning on the faucet, while in other places women and children must walk various miles every day to obtain water for their families. As population increases worldwide, the use of water in the domestic, agricultural and industrial sectors rises and the pressure on water resources intensifies. When water resources are degraded, they can impact every form of life, including human life. The challenge, therefore, is to overcome the need for competition and to find ways to harmonize the water requirements of people with those of the natural **environment**.

How to do it

1. Tell your group that you will be reviewing different facts related to the global water

crisis.

2. Write each of the following water facts on small pieces of paper:
   - In many regions of the world **freshwater**, both **groundwater** and **surface water**, is being used faster than it can be replaced. Already about one third of the world's population lives in countries suffering from moderate-to-high **water stress**. Scientists project that more than half the people in the world could be living in severely **water stressed** areas by 2032.
   - Some two million tons of waste per day are disposed of in open **freshwater** sources, including industrial wastes, agricultural wastes, human waste and chemicals. It is estimated that every minute 1.13 million litres of raw **sewage** are dumped into the Ganges River, the primary source of water for many Indians.
   - Unsafe water is the leading cause of sickness and death in the world. Unsafe water kills 200 children every hour. Infectious **waterborne diseases** such as diarrhea, typhoid, and cholera are responsible for 80 percent of illness and deaths in the developing world.
   - In just one day, 200 million work hours are consumed by women collecting water for their families. The average distance that women in Africa and Asia walk to collect water is 3.7 miles.
   - In all of Asia, only about 35 percent of the **wastewater** is treated, and about 14 percent is treated in Latin America. A minimal percentage of water has been reported to be treated in Africa. Even in industrialized countries, **sewage** is not universally treated.
   - **Freshwater** resources are being further squandered due to **pollution** and the way in which humans use water. Agriculture accounts for approximately 70 percent of world water consumption, and an estimated 60 percent of the water used for irrigation is wasted, lost to leaky canals, **evaporation**, and mismanagement. Fertilizer and pesticide residues from farming also contribute to the contamination of fresh water resources. Large cities waste their share of water too due to leaky systems.
   - About a billion people do not have access to safe drinking water, that is almost 1/6 of the world. Access to safe drinking water would send children (especially girls) back to school, empower women, improve community health and foster economic development.
   - One third of the people on Earth lack adequate **sanitation**. There are more cell phones in Asia and Africa than toilets.
   - Creating access to safe water for everyone is measurable and achievable. Lack of access to safe water is not a technical problem – it is a human, logistics, funding and efficiency issue. The world has the money to make it happen. In fact it would take 1/3 of what the world spends on bottled water in one year to pay for projects providing water to everyone in need.
   - Conserving and managing **freshwater** resources is politically and socially difficult; many rivers, lakes and underground **aquifers** cross national boundaries and are often shared by several countries, all with differing laws and beliefs about rights to use and ownership.
   - The return on investment in water and **sanitation** is enormous. For every $1

invested in water and **sanitation**, the United Nations Development Programme estimates a return of up to $9, depending on the region and technology.

Sources: Blue Planet Network, What makes clean water so important?
www.blueplanetnetwork.org/water/
Water Partners International, Global Water Supply, Middle School Curriculum, Water Aware fact Sheet,
http://static.water.org/pdfs/WPMidCurricFULL.pdf

3. Divide the participants into small teams and have each one pick a fact paper.
4. Explain that each team will have to prepare a small play to present their fact to the rest of the group.
5. Have each group present their fact and encourage discussion.

Discussion

Which water related fact surprised you the most?
Why can we say that water impacts everything?
Can you and your group do something to help fight the water crisis?

Water & Population

Level 2 3

Aim

To understand the relation between water use and population growth.

Materials

Internet access, pencils, copies of the Water, Water Everywhere? handout, glasses, two jars containing the same amount of drinking water.

Time

One hour.

Background

As the world's population grows, access to fresh water declines. This relationship is evident in both industrialized and **developing countries** and in both arid and wet **climates**. The amount of water in the world has always been the same and it cannot increase; as population grows, more and more people have to share this limited resource.

How to do it

1. Introduce the activity by defining the word scarcity and asking the participants to provide examples of scarcities with which they're familiar. Then ask the participants if they've ever experienced **water scarcity**, such as a **drought**. If so, what was it like? What did they have to do to conserve water? What was the cause of the scarcity? If no participants have been through a water shortage, ask them what they think it would be like and what they think they'd have to do in such a situation.
2. Tell the class that in some places around the world, **water scarcity** is a way of life. Why might this be the case? Do people always settle in places that have abundant water supplies, or do some people live in dry, desert **climates**? Suggest that even in places where **water scarcity** isn't a problem today, it might become a problem in the future. Ask them what might happen if a country's population increased. Might there be changes to water availability? Have students hypothesize answers to these questions and discuss their ideas.
3. Divide your group into small teams and give each one a copy of the **Water, Water**

Everywhere? handout and ask them to look at the *Water and Population data module* from the *Discovery Education* web page:

http://school.discoveryeducation.com/lessonplans/activities/watereverywhere/module.html

Explain the units on the data module (population in thousands and per capita water availability in cubic metres on the graph; **freshwater** scarcity, **freshwater** stress, and **freshwater** sufficiency on the pie chart).

4. Ask the teams to manipulate the data module so that it shows different world population and water data for the four different years. Ask them to examine the data, then answer the questions on the handout.
5. Discuss the team's answers as a group.

* *With the younger groups you can review the information from the Water and Population data module as a group and then you can play a game to show how population growth affects water availability and use:*

- Divide your group into two teams, explain that each one will receive a jar with water which they will all share in equal parts. Pour the same amount of water in the glasses and give one to each participant. Ask them not to drink it yet! Pour all the water back into the jars.
- Now explain that population has grown in team n.1 and tell half of the participants from team n.2 to go to team n.1. The amount of available water has not changed, so now each participant from team n.1 will receive less water. Pour the water in the glasses and give one to each participant.
- Discuss with the participants how they feel. What would happen if you had less water for your everyday activities? What changes would you have to make?

Discussion

What can you do yourself to ease worldwide water shortages?
How might a lack of water affect the way humans live?
What do you think must be done to prevent problems related to population growth and **water scarcity**? (individuals, businesses, governments).

Adapted from: Discovery Education, Lesson Plans Library, Water, Water Everywhere?,
http://school.discoveryeducation.com/lessonplans/activities/watereverywhere/index.html

Water, Water Everywhere?

1. By how much is the world population predicted to change between 1950 and 2050?

2. By how much is the average world per capita water availability predicted to change between 1950 and 2050?

3. What is the relationship between population and per capita water availability? In other words, as population increases, what happens to water availability?

4. Why do you think this is the case? Why do you see this relationship between population and water availability?

5. If the predictions for world population growth and per capita water availability come true, in what ways might the world be different in 2050 than it is today?

6. Which parts of the world do you think might face the most serious world shortages? Why?

7. Are you aware of any **water scarcity** problems in your region or community? If so, what is being done about these concerns? If not, do you think you might see **water scarcity** in your region in the future? Why or why not?

Water & Life Problem Tree

Level 1 2 3

Aim

To identify the causes and consequences of a water-related issue.

Materials

Whiteboard, whiteboard markers.

Time

One hour.

How to do it

1. Explain to your group that they are creating a **Water & Life Problem Tree**. Start by drawing a tree, with its roots and branches, in the whiteboard.
2. Write the problem in the trunk of the tree.
3. Identify the main causes of the problem and write them on the roots of the tree, below the problem. For example, '***Our wetlands were destroyed and now we are being affected by floods***'.
4. Think about the consequences of the problem and write them on the branches of the tree, above the problem.
5. You can add further layers, smaller roots and branches or leaves, by identifying the underlying issues that create the causes, and indirect or 'knock-on' effects.
6. Finally, your group could add neighboring trees, buildings, or animals living on the tree to represent other problems or related issues. Make sure to indicate the interdependence between all things.

Discussion

Why is it important to identify the 'roots' of the problem?
What can be a possible solution to your problem?
Who must participate to solve this problem?

Adapted from: World Association of Girl Guides and Girl Scouts, Climate Change take Action Now, www.wagggsworld.org/en/grab/21431/1/climate-change-take-action-now.pdf

Water, Development and Human Rights

Level 2 3

Aim

To reflect about the interdependency between water, development and **human rights**.

Materials

An outdoor setting, ball of yarn, paper, pencil, scissors.

Time

30 minutes.

How to do it

1. Take your group to an outdoor setting. Have them form a circle and give each participant one of the titles below.
2. Ask your group to think about the connections between water, development and **human rights**. Give the ball of yarn to one of the participants and, keeping hold of the beginning of the thread, have him/her pass it to another participant across the circle that is related to his/her title. Remind your group that they should always hold their part of the thread, so they can form a web. Continue until everyone is holding a part of the web.
3. Ask the first participant to pull on his/her piece of yarn. Do the others feel the pull? Help them understand how everything is interconnected.

Titles:

- Basic **sanitation**
- Good quality water
- Vulnerable populations
- Access to safe drinking water
- Increases risks of diseases
- **Water cycle**
- Growing and producing food
- **Groundwater**
- Hand washing
- Improved water management
- More **droughts**
- Keeps children out of school
- Human activities affect water quality
- Wasting water
- Health problems
- More **precipitation**

- Unsustainable human activities
- **Climate change**
- **Freshwater** is being used faster than it can be replaced
- A person can live without food but not without water
- Women and children collecting water
- Production activities
- Protection of the **environment**
- **Watersheds**
- Water **pollution**
- Consumption patterns
- Water conservation activities
- Recreation activities
- Population growth
- Water **filtration** and retention
- Means of transport
- Oceans, rivers and lakes
- Water related disasters
- More **evaporation**
- Home and shelter for animals
- **Urbanization**
- Economic growth
- Happy and healthy children
- **Habitat** loss and extinction
- Transboundary waters

Encourage your group to think further! Ask the participants to add more titles that they think are related to the topic.

Discussion

What is the connection between water and **human rights**?
What is the connection between water and development?
So, what would happen if our water supply was reduced?

Some Blue Goals

Level 2 3

Aim

To discuss about the Millennium Development Goals and their relation to water.

Materials

Paper, pencil, information provided below, internet access.

Time

A one hour session to explain the activity and give the participants some time to prepare their work, and a further one hour session to review the outcomes.

Background

The Millennium Development Goals (MDGs) are eight international development goals that were agreed to by all the world's countries and all the world's leading development institutions. They range from eradicating extreme **poverty**, to fighting disease epidemics, to providing universal primary education, and developing a global partnership for

development, all by the target date of 2015. They represent an unprecedented effort to meet the needs of the worlds' poorest.

How to do it

1. Explain to your group that they are going to discuss about the Millennium Development Goals and its relation to **water scarcity**.
2. Divide the participants into small groups and assign one of the MDGs to each one. Explain that they will have to prepare a small report that includes information and facts about their MDG so they can present it to the rest of the group and help everyone to become more conscious about the issue of **water scarcity**.
3. Give them enough time to prepare their work and then have each group share their report. You can find some useful information in the *UN Millennium Development Goals* web page:

   www.un.org/millenniumgoals/
4. Why not read the report to your entire school or youth group, everyone needs to be informed!

Discussion

How would you define sustainable water use?
How is **water scarcity** related to a human's ability to lead a happy life?
Why can we say it is everyone's responsibility to 'promote the right to water and **sanitation**'?

Water Scarcity and the Millennium Development Goals

The way **water scarcity** issues are addressed impacts upon the successful achievement of most of the Millennium Development Goals:

- *MDG 1:* access to water for domestic and productive uses (agriculture, industry and other economic activities) has a direct impact on **poverty** and food security.
- *MDG 2:* incidence of catastrophic but often recurrent events, such as droughts, interrupts educational attainment.
- *MDG 3:* access to water, in particular in conditions of scarce resources, has important gender related implications, which affects the social and economic capital of women in terms of leadership, earnings and networking opportunities.
- *MDGs 4 and 5:* equitable, reliable water resources management programmes reduce poor people's vulnerability to shocks, which in turn gives them more secure and fruitful livelihoods to draw upon in caring for their children.
- *MDG 6:* access to water and improved water and wastewater management in human settlements reduce transmission risks of mosquito-borne illnesses, such as malaria and dengue fever.
- *MDG 7:* adequate treatment of wastewater contributes to less pressure on freshwater resources, helping to protect human and environmental health.
- *MDG 8:* **water scarcity** increasingly calls for strengthened international cooperation in the fields of technologies for enhanced water productivity, financing opportunities, and an improved environment to share the benefits of scarce water management.

Source: UN Water for Life Decade, water Scarcity,
www.un.org/waterforlifedecade/scarcity.shtml

Water: Read All About It!

Level 2 3

Aim

To recognize water as a frequent and important subject in the news.

Materials

Newspapers (local, national), pencils, colour markers, cardboard, glue, composition paper, scissors, computer and publishing software (optional).

Time

Five 45-minute lesson periods.

How to do it

1. Ask the participants why people read newspapers. Why are they important to our society? Discuss why water is a 'newsworthy' subject. See if they can recall any water-related issues that have been in the news. The participants can also clip out articles related to water from different newspapers (local or national).

2. Discuss the different parts of a newspaper and make a chart of them. Talk about what each section contains. The chart could include the following:
   - news/features
   - entertainment
   - **weather**
   - sports
   - editorials
   - advertising
   - classifieds
3. Then give the participants different newspapers so they can see and discuss each part. Add to the chart if necessary.
4. Explain to your group that they are going to develop their own paper focusing on the theme of water. The topics could include such items as water rights issues, recreation, **pollution**, water uses, conservation, and so forth.
5. Divide the group into teams. The teams should brainstorm topics of interest for them to report on. (Option: to get more detailed, groups could have editors, photographers, word processors, researchers, etc.)
6. The participants could either research the topic and/or interview people to get the information to put into their article. As in all newspapers there will be a deadline of five days to complete the paper (or a total of five meetings).
7. All work should be proofread and corrected before handing in a final product to be placed in the paper. The layout could be done one of two ways: either on the computer using a newsletter or other publishing software, or it could all be done by hand.
8. Once the newspaper is ready, it could be distributed to the school or youth group or even to the community.

Discussion

Why is water a subject of interest in the news?
Which was your favorite article? Why?
Which were the rewards and frustrations of producing a newspaper?

Source: Penn State College of Agricultural Sciences, Water Lesson Plans, Water: Read All About It!, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water/6-8/read

The UN in Your Country

Level 2 3

Aim

To learn about projects that are being supported by different agencies of the United Nations.

Materials

Internet access, poster board, colour markers.

Time

1 hour to prepare the presentations, and another hour to share them with the group.

How to do it

1. Explain to your group that they will be researching about different water related projects that are being supported by diverse United Nations' agencies; the projects

range from **water scarcity**, to transboundary waters and capacity development. You can find this information in the

UN-Water Activity Information System (UNW-AIS):

www.ais.unwater.org/ais/aiscm/activity.php

2. Divide the group into small teams and have each one select a country. Explain that each team will have to make a small presentation about any chosen project.
3. Give them enough time to prepare themselves and on a next session have each one present their project.

Discussion

Which project did you enjoy most? Why? Which benefits will the project bring to the community?

How important do you think is the support that these agencies give to the beneficiary country?

Can you think of any water related project your community or country might benefit from?

Useful resources

Oxfam Water For All
www.oxfam.org.uk/education/resources/water-for-all

Hygiene Education
www.hygiene-educ.com/en/home.htm

Practical Action
practicalaction.org

The Weather Channel Kids
www.theweatherchannelkids.com

Water Aid
www.wateraid.org/uk/learn_zone/default.asp

Water.org
http://water.org/

Take Action

Introduction

Have you thought about the many benefits we receive from water? Washing our hands regularly with soap and water is the best way to stave off germs that make us sick, taking a warm bath can help us stay healthy and relax, drinking water boosts mood and brain power, we can grow all sorts of delicious foods using water, and we can find many wonderful aquatic animals in our lakes and rivers. The problem is that not everyone has access to this precious resource. Water use has been growing at more than twice the rate of population increase in the last century and, although there is no global **water scarcity** as such, an increasing number of regions are suffering because of water shortages.

Experts agree that our behavior has changed the world more rapidly and extensively in the past 50 years than in any other period of human history. There is enough **freshwater** on our planet, but it is distributed unevenly and too much of it is being wasted, polluted and unsustainably managed. Statistics say that by 2025, 1.8 billion people will be living in countries or regions with absolute **water scarcity**, and two-thirds of the world's population could be living under **water stressed** conditions. Moreover, the impact will be felt most directly by the world's poor as they are the ones that are less prepared to respond and adapt to changing conditions.

People have already borrowed too much from nature and now it is time for us to care for the planet that sustains us. Now that you know about the dangers our water resources are facing due to irresponsible human activities, you can identify what needs to be changed and what actions you can take to support the creation of a world that is healthier and more equitable. You can really make a difference by informing others and engaging in efforts to promote water access and conservation, starting from your local community.

Activities

Your Water-code

Level 1 2

Aim

To create your school or youth group's water values.

Materials

A meeting room, papers, pencils, poster boards, colour markers, colouring pencils, adhesive tape.

Time

One hour.

How to do it

1. Tell your group that you are creating your school or youth group's **Water-code**. The Water-code is a mission statement that should demonstrate, in a clear and imaginative way, your school or youth group's commitment to use water wisely. It should be memorable and familiar.
2. Explain to the participants that you are inviting some friends from other groups and classes to elaborate the Water-code; this is important as it will give everyone a greater sense of responsibility toward the values the Water-code represents.
3. Gather everyone in a meeting room and ask them to think about their school or youth group's aims and targets regarding water conservation.

   Here is an example:

   W.A.T.E.R

   Water will not be wasted;

   All of us will make a change;

   Together we will learn to care for it;

   Every day we will find new ways to save it;

   Respect for water is our aim.

4. Ask the participants to make some cool posters containing the Water-code. They must be prominently displayed throughout the school or youth group. For instance, post it on your notice board, in every classroom or meeting room, in communal areas, and in the staff room. The Water-code should also be presented to the local community at your different events.

Discussion

Is there any aspect in which your school or youth group needs to improve?
How do you think your Water-code will help overcome this?
How important is it that everyone develops a sense of responsibility toward applying your Water-code?

Adapted from: National Wildlife Federation, Global Warming, School Solutions, Eco-Schools USA, Become an Eco-School, Eco-Code,
www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Steps/Eco-Code.aspx

Be An Ocean Watcher

Level 1 2 3

Aim

To reflect about how to protect beaches and oceans and the life it sustains.

Materials

Cardboards, colour markers, adhesive tape.

Time

One hour.

How to do it

1. If you live near the seashore, this is a great way to encourage your group to be conscious about the importance of respecting and protecting the beach and the sea. Explain to them that they are going to create some signs to encourage everyone at school or youth group to act responsibly when enjoying a day at the beach!
2. Place the sings all around your school or youth group. Or you could even place them at the beach, in a restaurant or in a store; *be sure to ask for permission and to take the necessary safety precautions!*

Here are some ideas:

- Enjoy looking at animals and plants, but don't touch them or disturb their homes.
- Do not take away with you any beach treasure, leave it here for others to enjoy.
- Recycle motor oil at a gas station, everything that goes down the drain ends up in the ocean.
- If you have a beach picnic, don't forget to take all the trash with you. Trash that gets into the ocean can really harm the animals, especially plastic.
- Everything you dump ends up somewhere, and a lot of trash ends up in the ocean. Recycle!
- If you bring your pets to the beach, make sure they don't disturb the local wildlife.
- When it is safe, ask for tap water instead of bottled water, packing and shipping all that bottled water produces tons of **pollution**.
- Take the bus, ride your bike or walk instead of driving your car, this will burn fewer **fossil fuels** and cut back on **acid rain** and water **pollution**.
- Eat only fish that come from carefully monitored and sustainable fisheries or aquaculture. Be selective about the seafood you eat.
- Don't bring home wildlife plants and animals. Leave them in their **habitat**, they are very hard to keep alive.

Discussion

Have you ever been to a beach that had different trash items everywhere? How did you feel?
How do you think plants and animals living there can be affected?
How can trash affect ocean water?
Why is it important and necessary to respect and preserve oceans?

*Source: American Museum of Natural History, Ology, Be An Ocean Helper, www.amnh.org/ology/index.php?channel=marinebiology#features/stufftodo_marine/help_main.php?TB_*

iframe=true&height=500&width=750

Water Superhero!

Level 1 2 3

Aim

To create a water superhero for your school or youth group.

Materials

Poster boards, colour markers, colouring pencils, adhesive tape.

Time

Two one hour lessons (one hour to organize the activity and one hour to review the results).

How to do it

1. Have your group identify and discuss their favorite superheroes. What makes them a superhero? What powers might be needed to improve water quality around the world?
2. Explain to your group that you are organizing a drawing competition to find your school or youth group's **Water Superhero!**
3. Divide the participants into small groups and have each one make a poster to publicize your event. Don't forget to include all the necessary information:
   - Theme > remember to explain that you are looking for a superhero with super powers that can improve water quality and availability
   - Participants' age range
   - Size of the drawing paper
   - Drawing materials accepted
   - Deadline

   And of course don't forget to say that the new superhero will be used in all the publications, documents and activities your school or youth group might organize in favor of water and **sanitation**!
4. Place the posters all around your school or youth group. Make sure everyone hears about it!
5. Tell your group that they will be in charge of selecting the winner and awarding him/her with a cool certificate (or maybe you could even give him/her a prize of your choice).
6. You can also make an award ceremony with the entire school or youth group to congratulate everyone for participating and encourage them to continue caring for water.
7. Now that you have your superhero, you can talk to your school or youth group's director to encourage him/her to organize an activity where your superhero can invite everyone to make a change!

Discussion

What is the message the winner superhero wishes to transmit?
Who are your superhero's archenemies?
How important do you think it is to develop awareness about water conservation starting at a young age?
How might your superhero encourage children and youth to act?

I Need Water and So Do You!

Level 2 3

Aim

To generate understanding about every living being's dependence on water.

Materials

Poster board, colouring pencils, colour markers, internet access, books (to make some research about local animals).

Time

Two one hour lessons.

How to do it

1. Remind your group how every living being depends on water to survive and explain to them that the purpose of the activity is to explore this relationship from the perspective of an animal found in your **watershed**.
2. Divide your group into small teams and ask them to pick an animal from their **watershed**; maybe you could give them some time to research about their animal using the internet or some books.
3. Have each group discuss about their animal. How is the animal's **habitat**? Which is the animal's relationship with water? What water uses might affect the animal's health and its **habitat**?
4. Next, ask each group to use the poster board to create an advertisement from their animal's point of view telling why water is important to them. Remind them that through their advertisement they should try to convince the viewers to take action on the issue: conserve water, prevent **pollution**, protect **habitats**, etc.
5. Have each group present their advertisement to the rest of participants. Then, place the advertisements around your school or youth group to encourage others to act!

Discussion

How does your animal find and use water?
How would your animal be affected by water **pollution**?
Whose responsibility is it to protect your local **watershed**?

Adapted from: $H_2oh!$, Activities, Water Alive!
www.watercan.com/h2oh/g4wateralive.shtml

Stream Clean-Up!

Level 1 2 3

Aim

To learn how simple activities can improve the **environment**.

Materials

Poster boards, pencils, colouring pencils, markers, adhesive tape (to publicize the event). You might need different materials for the stream clean-up: rubber gloves, rubber boots, plastic bags, garbage cans, shovels, wheelbarrow to haul trash, truck to take away all the garbage.

Time

A one hour lesson (to organize the activity) and a whole morning (to develop the activity). You might need some more time to organize everything for the event.

How to do it

1. Explain to your group that you are organizing a **Stream Clean-up** and that you are going to invite everyone at your school or youth group to help; the more the better!
2. Divide the participants into small groups and have each one make a poster to publicize your event. Don't forget to include all the necessary information:
   - Theme of your activity
   - Day, place and hour of the event
   - Needed materials
   - Safety issues

   Place the posters all around your school or youth group. Make sure everyone hears about it!

For the stream clean-up:

1. Make sure you have any required permits to access your adopted stream before the day of your event.
2. Arrange in advance for the ultimate destination of all the debris collected and means to get it there.
3. The day of the event, arrange for garbage cans (you could also use plastic bags) at the event site.
4. List the tasks to be accomplished, hold meetings and assign tasks to different people.
5. Make a map of where people will be working and keep track of everyone.
6. Make sure everyone is aware of the safety issues: wear rubber gloves, wear rubber boots, don't pick up anything hazardous, work in pairs, call if you need help, etc.
7. When you are finished, record the amount and type of debris collected. Take pictures!
8. Provide information to the local media, you can even invite them to cover your event.

* Make sure you don't take with you anything that belongs to the stream! Here is a simple idea, if the object is more than half buried, a lot of

sediment would be stirred up, so leave it there. Have fun!

Be sure to take the necessary safety precautions!

Discussion

Where there a lot of people willing to help? Why do you think this happened?
How did you feel knowing that you were doing something to improve your **environment**?
How do you think the stream clean-up will help the **environment** and the life that it supports?

Best Water Conserver Ceremony

Level 1 2 3

Aim

To realize how nature really is the best water conserver.

Materials

An outdoor setting, an award ribbon, paper, pencils, colouring pencils.

Time

A 30 minutes lesson to organize the activity and another 40 minutes lesson to develop it.

Background

Have you heard that mother nature is very wise? Well this is completely true. Nature has thought about everything, including how to conserve water. Nature provides one of the best ways of conserving rainwater, which is the source of all **freshwater** in our world. Any vegetative cover, whether mere grass or a big forest, helps to slow the water running off the land. This helps to avoid soil erosion.

The canopy of vegetation, by absorbing the impact of raindrops, minimizes the destructive effects of the beating action of rain on soil. Moreover, roots of plants hold the soil together and prevent it from being washed away. They also help keep the soil porous thus helping rainwater percolate into the ground. The roots and stems also filter the silt out of the **run-off** water, slow it down and take the erosive power away.

The vegetative cover also provides decaying organic matter which forms an additional protection layer over the soil. This layer reduces the impact of raindrops. It also absorbs water and allows it to seep through the soil to be stored as **groundwater**.

Source: United Nations Environment Programme, Tunza, A Trip With Drip, http://unep.org/tunza/children/images/flash/a_trip_with_drip/start.swf

How to do it

1. Explain to your group that you are organizing a ***Best Water Conserver Ceremony*** in order to honor ***Mother Nature*** with an award for being the best water conserver. Tell them this will be a symbolic ceremony to encourage everyone to start preserving water.
2. Make sure you invite all the classes or groups from your school or youth group and all the teachers and leaders, you want everyone to start making a change! You can send out some invitations, ask your group to help you make them.

3. Prepare some words with the help of your group, so you can give a nice message to the assistants.
4. Hold your event in an outdoor setting where everyone can admire how great nature is. You can choose one of the prettiest trees you find there to put the award ribbon!
5. Don't forget to take pictures, so you can always remember this great day. To finish, encourage everyone to follow Mother Nature's example and to conserve water by wasting less, collecting more, storing more efficiently, by recycling **wastewater** and by not polluting.

Discussion

How was your event? Were people enthusiastic about it?
Who in your classroom/group do you think deserves an award for saving more water?
How can your school or youth group conserve water?

Cool in Blue Day!

Level 1 2 3

Aim

To encourage everyone at school or youth group to reflect about water and **sanitation**.

Materials

Posters boards, colour markers, colouring pencils.

Time

A 40 minutes lesson to explain the activity and prepare the posters, and another 30 minutes lesson to discuss about its outcomes.

How to do it

1. Tell your group that they are organizing a *Cool in Blue Day* to remind everyone about the importance of water and **sanitation**! Explain to them that the day of the event everyone at your school or youth group will have to dress in blue, that's right, the colour that symbolizes water!
2. Ask your group to make some cool posters to advertise their activity, invite everyone to participate! Make sure you include all the necessary information:
   - Theme
   - Date
   - Objective
   - Activity
   - Who can participate – everyone!
3. Also, have your group prepare a message about the importance of using water wisely and promoting **sanitation** for all so they can read it the day of the event. It is a good idea to read it through the microphone or during lunch time, when the entire school or youth group is gathered.
4. Discuss about the outcomes of the activity.

Discussion

What were some comments you received about the activity?
How do you think this activity helped your school or youth group to reflect about the need to act?
What does water mean to you? And what do you think it means to your school or youth group as a whole?

World Water Day

Level 1 2 3

Aim

To celebrate water and focus attention on its importance.

Materials

Poster board, colour markers, adhesive tape. Additional materials might be needed if your group organizes a special event too.

Time

A 40 minutes lesson to organize the activity and a one hour lesson to review the outcomes of the different activities that where developed. Some additional time might be needed if your group organizes a special event too.

Background

International World Water Day is held annually on March 22 as a means of focusing attention on the importance of **freshwater** and advocating for the sustainable management of **freshwater** resources.

An international day to celebrate **freshwater** was recommended at the 1992 United Nations Conference on Environment and Development (UNCED). The United Nations General Assembly responded by designating March 22, 1993 as the first World Water Day. On this day many people from all over the world organize different events to celebrate water. The United Nations declared 2013 as the International Year of Water Cooperation, therefore, its objective is to raise awareness, both on the potential for increased cooperation, and on the challenges facing water management in light of the increase in demand for water access, allocation and services.

How to do it

1. Explain to your group that you are having your own *World Water Day* celebration at your school or youth group.
2. Ask your group to make some posters to encourage and invite everyone to organize an event in celebration of World Water Day. Give them some ideas, maybe a conference, a contest or a sports event could be a good choice. Don't forget to include all the necessary information:
   - Day of the event – March 22
   - The objective
   - Where to register the activity (make sure you ask the necessary information to contact the participants once they have developed their activity in order to review their outcomes).

   Of course, your group can also organize a special event for World Water Day!
3. Don't forget to register your event on the World Water Day web page. You can also invite the local media to cover your event.
4. Visit the participants that registered their World Water Day activities and discuss with them about their outcomes.

Discussion

How many activities where developed on World Water Day at your school or youth group?
How do these activities contribute to water protection and conservation?

Did you make an activity of your own? How did it come out?

Only Rain Down the Storm Drain!

Level 1 2 3

Aim

To become aware about the close link between streets and waterways.

Materials

Poster boards, colouring pencils, colour markers, adhesive tape.

Time

One hour.

Background

Any water that runs down a storm drain flows directly into our waterways. It does not pass through the sanitary sewer system, and it does not receive any kind of treatment. This means that whatever we put down these storm drains winds up in the lakes and streams where we go fishing, boating and swimming. People who would never dream of polluting a lake or stream might pour antifreeze, fertilizer, paint or used motor oil, or toss pet waste, cigarette butts or litter down storm drains. It's up to each of us to reduce the **pollution** that comes from our cars, streets, driveways and yards. Together, our actions will add up to cleaner water for us and for future generations.

How to do it

1. Remind your group how cities have identified and cleaned up most of the big sources of water **pollution**, like industries and **sewage** treatment plants, and that now much of the **pollution** in our lakes and streams comes from small, scattered sources. Teaching people about the importance of preventing pollutants from reaching storm drains is a big way to help!
2. Explain to the participants that they are conducting an awareness raising campaign, *Only Rain Down the Storm Drain!* in order to encourage everyone to avoid non-point source pollutants (leaves, soil, litter, fertilizers, pesticides, street residues, etc.) and not to pour chemicals or sweep debris directly into storm drains.
3. Divide the participants into small groups and have each one prepare a cool and appealing poster regarding this issue.
4. Place the posters all around your school or youth group. You can even place some posters in the local library or supermarket, so you can teach your neighbors too.

Discussion

How did your school or youth group feel about the information you gave to them?
How do small things/activities help promote clean water?
In what other ways can you protect your water?

Adapted from: The Groundwater Foundation, Storm Drain Stenciling, How You Can Prevent Water Pollution, www.groundwater.org/ta/docs/stormdrainstencil.pdf

Water Cinema

Level 1 2 3

Aim

To learn that everyone can help raise money to support different projects that promote water access and **sanitation**.

Materials

Poster boards, colour markers, adhesive tape, internet access (optional), a movie of your choice, school or youth group theatre or meeting room with all the necessary equipment to project a movie.

Time

One hour to prepare the activity and two to three hours to watch the movie.

How to do it

1. Explain to your group that many projects that are developed by different organizations are carried out thanks to different donations generated through fundraising activities.
2. Ask your group to sit in a circle and to think about any water related project they might have heard about and that they might be interested in contributing to. It is a good idea for you to investigate about different projects that are being carried out in your country or, why not, you could plan a project of your own, maybe you know about a school that could use a new bathroom! You could also have the participants make a research about water related projects using the internet.
3. Explain to your group that you are organizing a **Water Cinema** day, where you will present a movie related to any water or **sanitation** topic in your school theatre or meeting room, in order to raise some funds and to contribute to the project of your choice.
4. Have the participants create some cool posters to publicize their fundraising event, tell them not to forget to include all the necessary information:
   - Day of the event
   - Objective
   - Ticket price
   - Place

   And don't forget to ask permission to your school or youth group's authorities to develop this activity!

5. Discuss with your group about the outcome of the event.

Discussion

How did your event turn out? How did you feel knowing you were working for a good cause?
How important do you think are fundraising activities to obtain the resources needed to carry out an activity?
What are the advantages of working together to achieve an objective?

Handwashing Day

Level 1 2 3

Aim

To teach others about the importance of washing our hands.

Materials

Paper, pencils, puppets; the participants might need different materials according to their planned activities.

Time

One to two hours to prepare the activities and another hour to present them.

Background

The Global Public-Private Partnership for Handwashing with Soap (PPPHW) is a coalition of international stakeholders whose focus is handwashing and child health. Handwashing with soap is the most effective and inexpensive way to prevent diarrheal and acute respiratory infections, which take the lives of millions of children in **developing countries**. Together, they are responsible for the majority of all child deaths.

Global Handwashing Day was originally created for children and schools, but can be celebrated by anyone promoting handwashing with soap. Each year on October 15, over 200 million people are involved in celebrations in over 100 countries around the world.

How to do it

1. Remind your group how washing their hands helps them maintain a good health. What diseases can be prevented thanks to handwashing with soap? Explain to your group about the Global Handwashing Day, and tell them that they are organizing their own *Handwashing Day* at their school or youth group.
2. Tell your group that you are creating a hand washing educational campaign for the school, youth group or community. Explain to them that you will prepare a puppet show in order to teach others about proper handwashing. Tell them to be creative, they can include songs, posters, and poems to make they show even funnier.
3. Give your group enough time to prepare themselves and, once they are ready, contact other groups or classes so you can present your handwashing puppet show. You can even present it to your community! You can do this activity on October 15, the Global Handwashing Day, or you can choose any other date, it is always a good time to inform others about the importance of handwashing.

Discussion

Why is it important to teach others about water and **sanitation**?
After which activities should you wash your hands? Why?
Why can we say that 'water is life'?

Rain Garden!

Level 2 3

Aim

To understand how rain gardens can help filter our water supply and improve our **environment**.

Materials

A piece of land – maybe from the school or youth group yard, native plants, shovels, gardening gloves.

Time

One hour to organize the activity and another two hours to construct your rain garden.

Background

During a rain event, water is collected by impervious surfaces such as rooftops, patios, driveways and parking lots. This turns into storm water runoff, which gathers pollutants and flows untreated into storm sewers and open ditches, eventually entering the city's creeks, streams, and reservoirs. A rain garden captures this runoff before it enters these systems. The water easily infiltrates into the soil because of the deep roots of the native plants, allowing for pollutant **filtration** and **groundwater** recharge.

How to do it

1. Tell your group that you are constructing a rain garden for your school or youth group. Explain to them what a rain garden is:
   - A garden planted as a shallow depression that captures and treats rainwater runoff.
   - A natural process that improves water quality by filtering pollutants and reducing the amount of storm water runoff.
   - A visual improvement for your school or youth group as it creates an attractive landscape with a variety of native plants and attracts birds, bees and butterflies.
2. Talk to your school or youth group authorities before developing this activity. ***Make sure you get their permission!***
3. It is also a good idea to ask your school or youth group's gardener to help you (or a professional gardener), so you can choose the right spot for your rain garden and the adequate native plants for it. Here are some ideas to keep in mind when constructing a rain garden:
   - Note the existing drainage pattern of your yard.
   - Find an area downslope from downspouts or impervious surfaces, such as driveways, where you can dig a shallow depression.
   - Avoid locations directly under tree cover or those prone to standing water.
   - Sunny or partly sunny areas are best for rain gardens, but shaded locations are also possible.
   - Make sure your rain garden is at least 3 metres from any building to prevent water from seeping into the foundation.
   - Rain gardens should not be placed over or near the drain field of a septic system.
   - Consider where the water will enter the garden and where it might overflow. Prevent excess runoff from going to a neighbor's property!

- If catching rainwater from a downspout, use creative ways, such as a river rock open channel, to direct water towards the rain garden.
- Add a berm on the downslope contour of the landscape to encourage rainwater to collect and infiltrate into the ground.
- Consider including a spillway, or notch, in the berm to provide an overflow path for water during larger rainfall events.
- Native plant species are recommended for rain gardens for their extensive root systems and tolerance to local **weather** conditions. Their deep root structures loosen the soil and help more water infiltrate the ground. A variety of native flowers, ferns, grasses, sedges, and shrubs can be used to customize the look of your rain garden.

4. Once you are ready, ask your group to help you construct your rain garden. Make sure you take the necessary safety precautions!

Discussion

How did your rain garden turn out?
Why do you think rain gardens are considered 'a best management practice'?
What are the benefits your rain garden will bring?

Source: Bluegrass Rain Garden Alliance, Rain Garden Brochure, www.bluegrassraingardenalliance.org/resources.html

Your Favorite Water Body

Level 1 2 3

Aim

To identify different and beautiful local water bodies.

Materials

Poster boards, colour markers, adhesive tape, pieces of paper, pencils, box.

Time

A one hour session to organize the activity, another 30 minutes session to prepare the exposition, and a last 30 minutes session to review the results of the contest.

How to do it

1. Remind your group about all the amazing lakes, rivers, waterfalls, beaches, etc. you can find in your country. Ask them to tell you about a memorable experience involving one of these places.
2. Explain to the participants that you are organizing a photo contest to discover your school or youth group's ***Favorite Water Body***. All the participants will have to present a printed photograph about a local water body, including a small description about that place.
3. Ask your group to make some posters to publicize your event. Make sure they include all the necessary information:
   - Theme
   - Participants' age range
   - Specific requirements > size of the photographs, length of the description, etc.
   - Deadline

- Place of delivery

4. Once you receive all the photographs, organize a cool exhibition. Place them on a visible place so everyone can enjoy all those amazing photos (assign a number or a code to each photograph so you can easily identify them). Don't forget to include some pieces of paper, a pencil and a small box so everyone can vote for their favorite water body.
5. You can exhibit the photographs for about five days. Finally, count the votes for each photograph and discover which is your school or youth group's favorite water body!
6. You can make a nice certificate for the winner; and don't forget to announce it to your entire school or youth group.

Discussion

Why do you think that water body was selected as the winner?
Which is your favorite water body? Why?
Why is it necessary to protect and respect all water resources? Can you think of some ideas how to protect your local water bodies?

Be Hydro-logical

Level 1 2

Aim

To encourage others to use water in a wise way.

Materials

Light blue cardboards or poster boards, colour markers, colouring pencils, scissors.

Time

One hour.

How to do it

1. Discuss with the participants about the many uses of water. How did they use water this morning? How can we save water through our everyday actions?
2. Explain to your group that many people are not aware of the importance of saving and protecting our water resources and that, for this reason, they are creating some *Be Hydro-logical* sings so they can teach others about the importance of using water wisely and looking after the **environment**.
3. First, have the participants brainstorm some water saving ideas, here is a small list:
   - Wash your car using a bucket.
   - Turn the tap of while you soap your hands or brush your teeth.
   - Wash your hands before eating.
   - Take a five minute shower.
   - Wash your hands after going to the bathroom.
   - Use a broom to clean your driveway instead of a hose.
   - Throw your litter in the dustbin.
   - Check your house for leaks and fix or replace those that are leaky.
   - Clean your street to avoid trash from going down the storm drain.
   - Close the tap while soaping the dishes.
   - Wash your fruit before eating it.

- Water your lawn either in the morning or the evening, rather than in the middle of the day, to help reduce loss of water due to **evaporation**.
- If your water is not safe to drink, make sure you boil or filter it before drinking it.
- Reduce your use of fertilizers and pesticides as these can end up in our streams and rivers because of storm water runoff.

4. Next, ask the participants to cut some pieces of cardboard shaped like a droplet, they will use these to write their water saving ideas. The participants can work alone or in small groups.
5. Once they are done, they can choose to put them around their school or youth group, or they can take them home or to the local library so they can share all those clever water saving ideas with their family and neighbors.

Discussion

How do your water use practices contribute to local water resources, positively or negatively?
Why is it difficult for many people around the world to find clean drinking water? How does this affect their lives?
Is there something you can do to help these people?

Water Posters

Level 1 2 3

Aim

To create an educational poster about water.

Materials

Poster board, colour markers, colouring pencils, adhesive tape, internet access.

Time

Two hours.

How to do it

1. Remind your group about all the different topics related to water you have learnt about: **watersheds**, **wastewater**, **groundwater**, water use, etc.
2. Explain to them that they are creating an educational poster about water, so they can share it with others in their school, youth group or community. You can use the ***United States Geological Survey Water Education Posters*** as a guide, they contain some great and useful information:

   water.usgs.gov/outreach/OutReach.html

3. Tell your group to choose a topic, or maybe you could combine different ones to make a really cool and complete poster, and ask them to draw it in a fun and appealing way.
4. Once they are done, you can place the poster in your school or youth group's library or in the local library, so you can share all that wise information with your community members.

Discussion

Why is it important to learn about water and the benefits it gives to all living beings? What are some of the problems our water bodies are facing today? Why has this

happened?
What can you do to thwart the negative effects of **water scarcity**?

Meatless Monday!

Level 1 2 3

Aim

To encourage people to consume products that have a lower **water footprint**.

Materials

School or youth group menu for a week, paper, pencil.

Time

One hour.

Background

Of all the water used around the world, as much as 70 percent is used in agriculture. Different types of food require different amounts of water to be produced; for example, it takes 560 litres of water to produce one kilogram of oranges, 15 415 litres to make one kilogram of beef, 214 litres to make one kilogram of tomato and 4 325 litres to produce one kilogram of chicken meat. As you can see, meat products have a higher **water footprint**, so choosing a meat free meal every once in a while can be a very wise idea.

How to do it

1. Remind your group about the concept of **water footprint** and how different types of food need varying amounts of water to be produced. Tell your group that a way of using water sustainably is by eating less water-intensive foods, and have them think how this can be good for their health and good for the planet.
2. If possible, review your school or youth group's menu for a week and discuss the following questions:
   - Is meat an expected part of every meal? Which is the most commonly served meat?
   - Are plant-based options available? At every meal? As a main dish? As a side-dish only?
3. Explain to your group that you are proposing a *Meatless Monday* to your school or youth group. Tell them that they will write a letter to the school or youth group director to convince him or her to accept your proposal.
4. Have your group brainstorm some ideas they might want to include. Have them chose what a good opening, body and closing would be. They can even include an example of a meatless menu they would like to enjoy.
5. Finally, make sure you all sing it, and you can even invite other groups to join your cause and sign it too!

Discussion

Why is a Meatless Monday a good idea for your school or youth group?
What new ideas did you learn about making food choices?
How can wise food choices help protect our water resources?

Green Advertisements!

Level 1 2 3

Aim

To give others a nice message about water and **sanitation**.

Materials

Video camera (a digital camera, a mobile phone with a camera or voice recorder could work if you do not have access to a video camera); the groups might need some additional materials for their videos/recordings.

Time

A 40 minutes lesson to organize the activity and another one to two hour lesson to make the videos/recordings.

How to do it

1. Explain to the participants that they are going to make some cool advertisements about water and **sanitation**. Have they seen any advertisements that use water?
2. Divide your group into small teams and tell them that they must make a fun video/recording about the following topic:

   Healthy Choices, Healthy Water, Healthy People!

   Explain that they can include all types of ideas related to water and **sanitation**, tell them to be creative!

3. On the first lesson give the teams some time to organize their ideas and think about any extra materials they might need.
4. On the next lesson, help them make their videos/recordings.
5. Finally, share the videos/recordings with other classes or groups. You could even send the best ones to a local radio or TV station!

Discussion

What does it mean when we say that people are the keepers of the Earth?
Why is it important to teach everyone about the importance of water?
How do advertisements help get messages across and influence people's points of view?

Humankind or Nature?

Level 1 2 3

Aim

To learn that humankind must find a balance between its needs and nature preservation.

Materials

Notebooks, pencils, guest speaker.

Time

A ten minutes lesson to explain the activity and to prepare some questions for the expert's visit, and another one hour lesson to receive him/her.

How to do it

1. Explain to your group that you are inviting an expert –a person who works in the environmental or conservation area- to come to your school or youth group to answer the following questions:

Can humankind be given priority over nature? Who decides this?

2. Before that day, make sure you encourage your group to think about the things they might want to know and help them prepare some questions. Don't forget to invite other groups and classes.
3. Discuss about the new knowledge you acquired.

Discussion

Do you believe humankind has acted careless and disrespectful regarding natural resource use? What has happened to water resources?
Are we still on time to revert the problems we have already caused to our water?
What changes do you need to make to promote water protection through your everyday actions?

Corporate Responsibility

Level 2 3

Aim

To reflect about the role companies have in water protection.

Materials

Papers, pencils.

Time

40 minutes.

Background

Companies also have a role to play in the protection of our **natural resources**. Corporate Social Responsibility (CSR) has become a slogan entering the global debate. As companies have started to become more powerful worldwide, it is generally recognized that they must embrace responsibility for their actions and encourage a positive impact through their activities on the **environment**, consumers, employees and the community.

How to do it

1. Remind your group how companies have a social responsibility; discuss how they must assume the environmental impacts of their production and undertake different activities to protect the natural world.
2. Explain to your group that they are writing to a local business to ask it to sponsor an event. Ask your group to think about any creative activity they might want to develop in favor of their local water resources:
   - An art exhibit about water conservation;
   - A street clean-up;
   - A **sanitation** role play;
   - An awareness walk/run to encourage water protection;
   - A lake clean-up;
   - And many more!
3. Have your group brainstorm some ideas they might want to include. Have them chose what a good opening, body and closing would be.
4. Write the letter with the help of your entire group and make sure you all sign it.

Discussion

Have you heard about other initiatives local companies have taken in favor of water and **sanitation**?
What do you believe is the role companies have in your community?
Why is it important that every company integrates corporate citizenship values into their business models?

Useful resources

American Museum of Natural History
www.amnh.org/learn-teach

Eco kids Canada
www.ecokids.ca

Globio
www.globio.org

United Nations Environment Programme TUNZA
www.unep.org/Tunza

United Nations Cyber School Bus
www.un.org/cyberschoolbus

WWF Our Earth
http://wwf.panda.org/about_our_earth/

Glossary

Accessible — easy to approach, reach, enter, or use.

Acid rain — rain or any other form of **precipitation** that is unusually acidic, that is, it contains chemicals that can have harmful effects on plants, aquatic animals, and infrastructure. Acid rain is caused by the high emission of **greenhouse gases** due to human activities.

Aquifer — an underground layer of permeable rock or soil which can contain or store water.

Atmosphere — it describes the air or gases that surround the Earth.

Atom — everything is made of tiny particles called 'atoms'. These particles are like small 'building blocks'. Atoms combine and are held together to make up '**molecules**' of different substances.

Biodiversity — the variety of plant and animal life in the world, and the relationships between them.

Climate change — a significant change in the overall state of the Earth's **climate** (such as temperature and rainfall) caused both by natural and human causes. This may present harmful effects for all living beings as many animals and plants need one kind of **climate** to survive.

Climate — the average **weather** conditions for a particular place and time period. This is not the same as **weather**; **weather** may change from day to day, but **climate changes** over hundreds or thousands of years.

Condensation — the process by which gas or vapor cools and turns into liquid.

Density — a measurement of the degree of compactness of a substance; it refers to the amount of 'stuff' packed in a given space. If a substance is denser, this means its **molecules** are more tightly packed together.

Desalination — the process by which salt is separated from water, so that pure water is left behind.

Developing country — a poor country whose economy relies heavily on agriculture and that is trying to advance economically and socially.

Drought — a long period of unusually low rainfall, leading to a shortage of water.

Ecosystem — a community of living **organisms** (plants and animals) and non-living things (water, air, soil, rocks, etc.) interacting in a certain area.

Environment — the air, water, soil, minerals, living **organisms**, and all other things that act upon a creature or a community. The circumstances that surround each one of us.

Evaporation — the process by which heat turns a liquid into gas or vapor, such as when the sun's heat turns the water in rivers or lakes into vapor or steam.

Filtration — the action of removing impurities or solid particles from a liquid or gas.

Flood — when an area of land becomes covered by water due to, for example, heavy rain.

Food security — when all people can always have access to sufficient, safe and nutritious food to lead an active and healthy life.

Fossil fuels — a general term used to refer to coal, natural gas and oil (petroleum), which are substances that where formed during millions of years from plant or animal remains.

Freshwater — naturally occurring water that is not salty, like water from rivers, lakes or **groundwater**.

Greenhouse gases — the gases that occur naturally on the Earth's **atmosphere** that absorb and trap heat to keep our world warm. Some examples are water vapor, carbon dioxide, methane, nitrous oxide and others. Some human actions also produce these gases, such as the burning of **fossil fuels**.

Grey water — used or slightly dirty water, for example, from sinks and showers.

Groundwater — water held underground in the soil or in rock formations. This is the Earth's biggest storehouse of drinkable water.

H_2O — the scientific name for water. It's an abbreviation for the fact that a water **molecule** is made up of two hydrogen **atoms** (H – so H_2) and one oxygen **atom** (O).

Habitat — the natural home or **environment** of an **organism**.

Human rights — the basic things which all people should have or are entitled to, such as justice, freedom to say what they think and access to safe drinking water and **sanitation**.

Hygiene — practices, such as frequent hand washing, that contribute to the promotion and preservation of cleanliness and health.

Molecule — when individual **atoms** stick together, they make up small clusters called 'molecules'. Different molecules make up different substances. Water, for example, is made up of molecules which contain two hydrogen (H) **atoms** and one oxygen (O) **atom**, which is why water's scientific name is **H_2O**.

Natural resources — materials or substances that can be found in nature and that can be used by and are of great benefit to humans. Some examples include water, soil, wood, plants and rocks.

Non-point source pollution — **pollution** that is difficult to identify because it involves any pollutant that enters the stream by way of surface runoff. This means that the **pollution** cannot be traced back to a specific source because it comes from many different sources throughout the **environment**. The pollutant might originate anywhere in the **watershed**, near the stream or miles away. Storm water runoff can collect many different types of **pollution** from different sources before it reaches a body of water, including trash, dirt and chemicals.

Nutrient — a chemical which animals and plants need to live and grow.

Organism — a living creature, like a plant, animal or microorganism.

Perspiration — the release of sweat (water with chemicals dissolved in it) from pores in the skin of animals.

Point source pollution — **pollution** that is easy to identify as it can be traced directly to its source. For example, if there is an oil spill caused by an oil tanker, you can 'point' your finger at the exact source of the **pollution**.

Pollution — the introduction of harmful or poisonous substances into the natural **environment**.

Poverty — not having enough money or resources for basic needs: clothing, shelter and food.

Precipitation — the process whereby water vapor in the **atmosphere** condenses and falls in the form of rain, sleet, snow or hail.

Renewable resource a resource that can be replaced or replenished, either by the Earth's natural processes or by human action. Air, water, and forests are often considered to be examples of renewable resources. However, due to local geographic conditions and costs involved, many argue that water may not be a completely renewable resource in some parts of the world, especially in areas which rely on limited **groundwater** supplies.

Run-off the flow of water that occurs when the soil is saturated and excess water from rain, snow, etc. runs over the surface of the land and flows down hill into rivers, streams, lakes or the ocean.

Salinity 'saline' is another word for 'salty'. Seawater is naturally saline, it contains salt.

Sanitation the application of measures to maintain clean, hygienic conditions that help prevent disease.

Saturated zone the area in the ground that is soaked with **groundwater**. The top of this saturated zone is called the **water table**.

Scarce not easy to find or get.

Sewage **wastewater** that is carried away from homes and other buildings in a system of pipes.

Surface water the water that is available on the ground surface, for example, water in rivers, lakes and the ocean.

Transpiration a process where moisture is released from tiny holes called 'stomata' (meaning 'little mouths' in Greek!) on the underside of plant leaves.

Urbanization the process by which people move from the countryside to go and live in towns and cities, often in search of better jobs and living conditions. This process makes cities become larger and larger.

Wastewater water that is not clean because it has already been used by homes, businesses, factories etc.

Water cycle the continuous movement of our planet's water on, above and below the surface of the Earth. This process restores and recycles water, allowing all living beings to access clean water.

Water footprint when talking about an individual, it refers to the sum of his or her direct and indirect **freshwater** use. Moreover, the water footprint of a nation shows the total quantity

of water that is used to produce the goods and services consumed by the inhabitants of the nation.

Water scarcity — water supplies are considered '**scarce**' when annual water supplies drop below 1 000 cubic metres per person per year (Source: UN). Water scarcity is defined as the point at which the aggregate impact of all users interrupts the supply or quality of water to the extent that the demand by all sectors, including the **environment**, cannot be satisfied fully.

Water stress — the situation arising when water supplies drop below 1 700 cubic metres per person per year (Source: UN).

Water table — the upper surface (or level) of water stored underground in the **saturated zone**.

Waterborne diseases — illnesses that are most commonly transmitted in contaminated fresh water. Infection commonly results during bathing, washing, drinking, in the preparation of food, or the consumption of food thus infected. An example of such disease is diarrhea, which affects mainly poor children in **developing countries**.

Watershed — all the area of land that sends rain into a common body of water, such as a river, a stream, a lake or the ocean.

Weather — it describes what the day looks like outdoors in a specific place at a specific time. Weather can change a lot in a very short time; it refers to what happens from minute to minute. For example, it may rain during the morning, but you may have a sunny afternoon.

Resources and additional information

Join us!

Additional resources and information will be developed in collaboration with our partners for you to use when helping children and young people to learn about the different issues that affect our world. If you would like to be automatically informed of the new materials that become available please write to us at: *yunga@fao.org* and we will register you to the free YUNGA newsletter.

We encourage everyone, especially young people, to stay connected with YUNGA by following us on:

Facebook *www.facebook.com/yunga.un* and Twitter *@UN_YUNGA*

Share with us!

It would be great to receive your comments and information about your own experiences, activities and stories. Contact us at *yunga@fao.org*

Take the challenge!

Children and youth need to understand the environmental and social realities of our time and of their future. We need to support them to become empowered and responsible citizens of the world, able to adapt and to respond to future challenges.

The *Water Challenge Badge* is a tool to allow teachers and youth leaders to guide young people in learning about the crucial role water plays for life on Earth. The booklet includes basic background information on water, the **water cycle** and how water sustains life, as well as outlining why humans need clean water and **sanitation** to stay healthy. The badge looks at the different factors which affect our water supply (such as over-use, **pollution**, natural hazards and **climate change**) and considers how water can be conserved and used more efficiently.

The badge includes age-appropriate activities which help young people to gain knowledge, skills and values to protect, preserve and improve our water resources. The badge will also help them realize they can make a difference and that they are capable of finding innovative and lasting solutions to our world's challenges. Encourage your group to take the challenge!

www.fao.org/docrep/017/i3225e/i3225e.pdf

Organizing events and activities

Interested in making a difference through your own initiatives but not sure where to begin? Here are some ideas to get you started!

Find out!

You can find out more about water in your country by getting in touch with the people that work on this issue. Encourage them to share their knowledge and information on their projects with you. Find out what they are doing and try to join their activities. For example:

* Representatives of UN agencies: FAO, UNDP, UNESCO, UNICEF, WHO, UNEP, UN-WATER
* Ministry of Agriculture
* Ministry of the Environment
* Ministry of Education
* Ministry of Health
* Non-governmental organizations and international non-governmental organizations
* Universities and other schools
* Community groups
* Religious groups

Think!

You can organize many lively activities: competitions, fairs, sports, conferences, debates, round-tables, workshops, concerts, drama, painting, photography, posters, collages, songs, poems, essays, slogans, letters, and many, many more!

Raise your voice!

Invite families and the community to contribute to and participate in your activities. Encourage the media to help you publicize your event and promote public awareness. Contact local news reporters to write stories about your activities and local and community radio stations to broadcast information and messages.

Sponsor and partners

This resource and activity guide has been developed with the kind financial support of the

Swedish International Development Agency (Sida).

www.sida.se

The Water Resource and Activity Guide was developed in collaboration with:

Bancroft Arnesen Explore

Bancroft Arnesen Explore aims to inspire and promote the achievement of dreams by empowering youth to explore issues that affect their world. Find out about the 'Access Water 2013: A Journey From Hope To Action' expedition at:

www.yourexpedition.com

Convention on Biological Diversity (CBD)

The Convention on Biological Diversity is an international agreement that commits governments to maintaining the world's ecological sustainability through conservation of **biodiversity**, sustainable use of its components, and the fair and equitable sharing of the benefits arising from the use of genetic resources.

www.cbd.int

Food and Agriculture Organization of the United Nations (FAO)

FAO leads international efforts to enhance global agricultural performance while promoting the sustainability of water use for food production. Serving both developed and **developing countries**, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information, helping countries to modernize and improve agricultural policies in relation to land and water management.

www.fao.org/climatechange/youth

The UN-Water Decade Programme on Capacity Development (UNW-DPC)

The UN-Water Decade Programme on Capacity Development (UNW-DPC) strengthens the coherence and effectiveness of the capacity development activities of the 30 UN organizations and external partners working together within the inter-agency mechanism known as UN-Water. UNW-DPC collaborates with UN-Water members and partners on individual, institutional and organizational capacity development in a range of thematic areas related to water.

www.unwater.unu.edu

The World Association of Girl Guides and Girl Scouts (WAGGGS)

WAGGGS is a worldwide movement providing non-formal education where girls and young women develop leadership and life skills through self-development, challenge and adventure. Girl Guides and Girl Scouts learn by doing. The Association brings together Girl Guiding and Girl Scouting Associations from 145 countries reaching ten million members around the globe.

www.wagggsworld.org

The World Organization of the Scout Movement (WOSM)

The World Organization of the Scout Movement (WOSM) is an independent, worldwide, non-profit and non-partisan organization which serves the Scout Movement. Its purpose is to promote unity and the understanding of Scouting's purpose and principles; while facilitating its expansion and development.

www.scout.org