



engineers without borders uk

Water for the World

Accompaniment to Slides

Before presenting a “Water for the World” workshop to a class, make sure you have looked over the PowerPoint presentation and that you are comfortable with it. The purpose of these notes is to provide you with some additional information for each slide to help you in making the presentation. If you have any questions about the slides, do not hesitate to ask.

Don't forget that the purpose of these workshops is to introduce students to ideas about science and geography in a **fun and dynamic atmosphere**. This should be a lot of fun for the presenters too!

Things to do BEFORE the presentation

1. Have the materials ready the DAY BEFORE the presentation. This saves lives. Have each filter material (sand/gravel) in a Ziploc bag, ready to be given directly to students.
2. When you get to the school, get the teacher to help you set up the room into a group working space, with about 4-5 people per group. This is handy for the filtration exercise! **WARN TEACHERS THAT YOU ARE GOING TO SPLIT CLASS INTO GROUPS AND WILL NEED THEIR HELP IN DOING SO.**
3. Figure out if you will be having an advanced group or a non-advanced group. Advanced means that they are smarter, more co-operative and up for a challenge and so can be counted on to get on with the filtration activity with little/no hints.
4. Set up the filter materials in the front of the room on a separate table, and have a good place to keep your money (i.e. away from kids).

Introducing the workshop

You can start the presentation by introducing yourself and Engineers Without Borders. Let students know that you are going to give them a short presentation and that you hope they will participate a lot. The presentation will be followed by an interactive activity and followed up by a discussion.

Slide 1: Water: our basic needs

**How dependent are we on water?
How much do we need vs how much we use.**

Very much so. We can survive for only a day without water. 72% of our body is water! We can survive for a week or so without food. You might want to hold up a 1L bottle or bottle of known size and get students to imagine what 20L, 50L, 140L looks like. You can also ask them how much 1L of water weighs (1kg) and then have them imagine what 20kg, 50kg, 140kg weighs (140kg is probably about 3 times their weight!)

Note that **we use between 2-7 times the amount of water that we need everyday.**

What do we use water for?

Ask students to list the different reasons that we use water.

Slide 2: What do we use water for?

Water for other uses Even though 20-140L may seem like a lot of water, you can explain that agriculture can account for 90% of water consumption in some countries, and that a lot of water gets used in industry as well (e.g. mining, power plants, etc.)
If in Science, throw in Photosynthesis for good measure!
Remember: $\text{water} + \text{CO}_2 \rightleftharpoons \text{O}_2 + \text{glucose}$

Slide 3: How much water do we use?

Animated slide

Get students to guess how much water they use for the 5 listed activities. Remind them what 1L looks like to help them with their guesses.

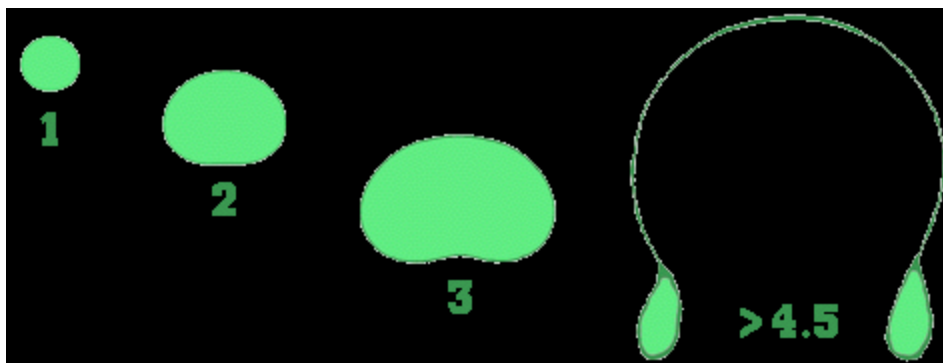
When numbers come up for showers and baths, you can remind them that a shower can be worse than a bath if they stay in there for a long time!

Slide 4: Where does your water come from?

Where does the water come from?

The water we drink in Oxford is primarily from rainwater, which has eventually made its way into the Isis. You might want to ask them if they would ever drink water right out of the Isis. Why not? Interestingly, rainwater is generally pure – but can also be contaminated by pollution in cities. Acid Rain in Scandanavia.

INTERESTING FACT: Did you know that rain drops are not tear-shaped? This is only caused if they are emitted from a source (e.g. tap). But naturally, they vary from a perfect sphere (1mm diameter), to a hamburger bun (3mm) and a crazy parachute shape (>4.5mm). Check out these photos:



Note: these form due to a “tug of war” between Surface tension (sphere) and pressure due to speed (hamburger).

AWESOME!!!

Slide 5: Contaminants in drinking water

Ask the kiddies what they think could be harmful in water. Ask the kids how do they think the water is clean? Then ask them if you give them a cup of water, which doesn't have any particulates, would they drink it?

What's in the water Most rivers have water that is contaminated with micro organisms, dissolved chemicals, and particulates.

Micro organisms: can affect your health immediately by, for example, causing diarrhea related illnesses. Often these come from sewage entering the river. **Diarrhea** is a major killer - killing more than 1.5 million per year.

Dissolved chemicals: can affect your health in the longterm, leading for example, to **cancer**. These can come from a variety of sources. For example, pesticides used for agriculture or on your grass can get into the water.

Particulates: These would be small particles of dust, mud from the riverbed, debris from the air that settles on the water, etc.

Note that while we can often see particulates in the water, we can't see micro organisms or dissolved chemicals so **we can't determine if our water is contaminated or not just by looking at it!**

Slide 6: British Cities: Where does drinking water come from?

Treatment Given that our source water is contaminated, we treat it. This requires multiple stages. Some of these stages remove the particles that we can see. The idea is to remove those particles and let the water pass. Then we can treat water for the contaminants that we can't see.

Add Chemicals and Stir (A.K.A .Coagulation and Flocculation) A chemical is added to make charged particles attract and stick to each other.

Settle (Sedimentation) Large particles can then settle out in the sedimentation stage.

Filter Cleaner water is left at the top and spills over to the next stage. The spilled over water passes through a filter that blocks out any remaining particles.

Disinfect The water then goes through a chemical disinfection process to kill anything that is very small that couldn't be filtered out. E.g. viruses (which are micro organisms).

Storage and distribution

This clean water is then stored and delivered to your home/ school, etc. by pipes and comes out of your tap where you drink it without thinking about it.

Slide 7: Fail proof?

This seems like a fail proof process

The treatment process is complicated, comprehensive, and very expensive. We expect that it will always work but sometimes, even in rich countries, it breaks down.

Ask the students if they know of instances where people have gotten sick in the UK from drinking water?

North Wales

In the fall of 2005, there was an outbreak of “Cryptosporidium” – a little guy that causes diarrhoea – that affected 231 people. Water treatment facilities are now upgrading their systems. Some of them are doing this faster than others – it’s an expensive process.

If this can happen in the UK

Imagine, though, if this kind of failure can happen in the UK, what can happen in developing countries where there isn’t the money or the infrastructure to treat water in this way?

Slides 8 and 9: Quick quiz

Answers

Ask the students the following questions and have them **vote** for different answers.

1 – b) (6.5 billion)

2 – c) (1.1 billion)

3 – b) (30-50 times)

4 – d) (80%)

everyday, 6000 people die of diarrhoea-related diseases – most of these are children under the age of 5

5 – c) (10 000 – 100 000)

while 6000 may die of diarrhoeo-related diseases, there are many other water-borne diseases such as malaria.

6 – d) (hand washing)

Improved water supply reduces diarrhoea morbidity by 21%.

Improved sanitation reduces diarrhoea morbidity by 37.5%. **The simple act of washing hands at critical times can reduce the number of diarrhoeal cases by up to 35%.** Additional improvement of drinking-water quality, such as point of use disinfection, would lead to a reduction of diarrhoea episodes of 45%.

Slide 10: Who likes rain?

Ask the little buggers if they like rain or not. Congratulate anybody who does. Point out that rain is the easiest source for our water needs and is vital for our survival. This is why people in desert region go bonkers when they do get rain. Also point out that rain is crucial for farmers in poorer countries and that drought is a HUGE problem.

Water poverty index This is a special index that measures a number of things, including: water availability, how easy it is to access, people's capacity to access it.
The lower a country's water poverty index, the easier it is for its citizens to access water.
The map shows that countries vary a lot in terms of how much water is available for its citizens to use.

Slide 11: Social equity (School vs Heavy Water Buckets)

Implications of high water poverty index In much of the developing world, water isn't piped directly into homes – people have to collect water for themselves.

Most often, it is **women and children** who are responsible for collecting water.

This means that often girls don't go to school and **don't get an education** because they have to walk, sometimes for several hours a day, to collect water.

Time collecting water is also time that can't be spent **earning money, growing food, or doing other important things** for survival and for enjoyment.

Can you imagine if, instead of going to school, or playing sports, or playing computer games, you had to walk for 3 hours and carry buckets of water on your head?

Slide 12 + 13: The Filtration Challenge!

Lead in We have already discussed the fact that most places in the developing world don't have access to water treatment facilities like we do in rich countries.

So how do they get clean water?

Sometimes they drink the water directly. Not the best solution.

But simple technologies can help them to drink cleaner water too.

The Challenge: The class is split into groups (4-5 per group). Each group = different country. Each country given an info pack, and money. The idea is for them to interact with other groups and build a working filter in 20 minutes. This is followed by a break and then presentations for each group.

What you need to do:

- 1) Explain the challenge. **Make it clear that illegible instructions are due to illiteracy rates and amount of money due to GDP.**
- 2) Lay down the rules (1 person per group buys, stealing NOT allowed, talking is allowed)
- 3) At the point **Think of the “bigger picture” here :**
For non-advanced groups: explain that there is enough material and resources to build all filters easily. **Encourage interaction.**
For advanced groups: let them figure this out themselves. **Encourage interaction.**
- 4) Hint for them to co-operate (but don't say this in a direct fashion!)
- 5) Split class into groups – **warn teachers in advance** of this! Get them to help you choose groups. **Rule of thumb when selecting groups:** put most disruptive students (if any!) in richer countries, and the most conscientious ones in the poorer ones. That way, you have a better chance of getting an interesting result.
- 6) Get started!! Allocate one person to the front desk. Have the other presenters walk around and prod groups. Talk to the kids, offer advice. Encourage co-operation. Enjoy it!
- 7) Be FIRM when time is up. Call each group to the front, take their filter, mark it, and take their remaining money.

Timing of the activity: 20 minutes to build and interact. BREAK (Pour clean water into each filter in this period). Post-break, allocate about 15-20 minutes for each group to come to the front, talk about their info packs (how much money, how much info) filter and also test them out. Ensure each group gets a round of applause.

Slide 14: How does the activity relate to the real world?

Class discussion

Lead a group discussion about what students learned from the activity. Look to talk about:

Different amounts of money per group •Based on actual country's Gross Domestic Product (GDP)

Illegible instructions •Based on actual country's illiteracy rate

Resourcefulness of groups with little money •People in poorer countries have their own coping mechanisms

Collaboration between countries •Richer countries may offer “Official Development Assistance” (ODA) to poorer countries

Use the table to compare what happens in reality.

Slide 15: The Real World

This slide is played out by 2 voices. So either one person could act out two different people, or you could have two presenters. Having a baseball cap as a prop for the second voice would be REALLY COOL.

Also, ALWAYS ask before you EXPLAIN NEW TERMINOLOGY, like the two below. Never assume knowledge, but **always** congratulate it!

GDP Gross domestic product: GDP is the total value of goods and services produced by a nation in that nation.

GNI Gross national income: The total income earned by the citizens of a country. Equal to gross domestic product (GDP) plus income earned by residents of the country living outside of the country, minus income earned in the country by non-residents (formerly GNP).

Slide 14: "Appropriate Technology"

It's not just about technology

We don't give just money to developing countries. We give **technical assistance** too. Sometimes we **transfer** technology to other countries.

A water filter is one example of a simple technology that can help provide access to safe drinking water.

There are many other technologies and techniques available to ensure a safer source of drinking water (e.g. pumps, solar distillation, water disinfection, boiling water, chlorination...)

But it's not just the technology that is important – there are other factors too.

Start off with the Ferrari example. Why would a Ferrari be useless in a desert? What would be better?

Move on to water – would a desalination plant be good for a poor country with power generation problems? Why not? Get the students thinking!

Stress that any solution should be a **long term** one.

Slide 14: Thinking about technology more broadly

Social issues

Who benefits from the technology? Who loses? Does it make life easier for women and children? Is the technology available to rich AND poor people?

Example: The location of a pump can be a very politically charged issue. Is the location equally accessible by everyone? If not, how does this affect people differently?

Cultural issues

Water can mean different things in different cultures. For example,

water can sometimes have a spiritual meaning to communities.

**Information,
knowledge, skills**

Technology breaks down and someone has to understand how it works in order to **maintain and fix** it. Does that knowledge and do those skills exist?

Affordability

Can people afford the technology? Can they afford to maintain and repair it?

**Ability to make
locally**

Are the materials needed to build and maintain the technology locally available? If not, people in poor countries probably won't have the money to have parts shipped from overseas when a technology breaks down.

Ownership

We often take care of things better when they belong to us. Experience shows that international organizations are more successful in helping people to access safe drinking water when those people own and feel responsible for the technology.

Slides 17-20: What can we do to make a difference in Oxford?

**Taking action from
home**

We've seen that people in developing countries often live under very difficult conditions with little access to water. We know that our governments transfer money to help and sometimes technology and support as well.

But what can we in Oxford do to make a difference.

We can start by using our own water more efficiently (**slides 18-19**).

We can also try to make a difference overseas (**slide 20**)

Extra Information:

HEALTH

- Each year, 3-4 million people — of which 2 million are children — die from preventable diseases caused by unclean water
- Water-related diseases are among the most common causes of death of people in developing countries – the majority of those affected are under the age of 5. Access to clean water is key in fighting these diseases.

For example:

Diarrhoeal diseases: Every day, diarrhoeal diseases cause some 6,000 deaths, mostly among children under five; Between 1,085,000 and 2,187,000 deaths due to diarrhoeal diseases can be attributed to the 'water, sanitation and hygiene' risk factor

THE CASE OF ACCESS TO WATER IN GHANA

- Apoyanga Nash from the remote village of Asamponbisi in the Upper East Region of northern Ghana a small, muddy pool was her only source of water for a long time. Every day she had to go there and wait for hours in a long queue, and wait as water slowly seeps through the mud, and then lug the heavy load home. Despite the amount of time it takes to get the water, it still could host any number of lethal diseases. She said, "I have lived here for around 17 or 18 years, since just before my first child was born. Before the pump was here, we used to go to the stream to fetch water. There wasn't enough water there. In the dry season we had to queue. The water didn't flow; we had to dig a scoop hole and wait for the water to seep up. When the children drank that water, they used to get diarrhoea and stomach pains. We didn't understand exactly what was wrong but we knew it was because of the water."
- The village has since been helped through a clean water pump supplied by an organisation called Water Aid, but the reality is that most villages still survive on scarce and often dirty water
- Another young girl in the same village, Napoga Gurigo, often had to spend at least six hours a day collecting water, and so couldn't go to school