SECONDARY LEVEL

FACILITATOR'S PACK

Water for Everyone Everywhere is a hands-on enquiry-based workshop that enables pupils to explore the global issues associated with water access and the role that engineering plays in water distribution.

UK
ENGINEERS
WITHOUT BORDERS

Last dated update of this document: 09 September 2019.

This document and the accompanying materials are available to download from: www.ewb-uk.org/water-for-everyone-everywhere.

Engineers Without Borders UK is a registered charity in England and Wales (No. 1101849) and Scotland (No. SC043537) and is a company limited by guarantee (No. 4856607). www.ewb-uk.org

OVERVIEW

Water for Everyone Everywhere is a workshop designed to encourage pupils to explore the challenges associated with access to safe, clean drinking water around the world. Pupils learn about the importance of water to people's everyday lives and the role that engineering infrastructure plays in the distribution of water. Pupils design, build and test their own model water filter as part of this workshop. This workshop builds on the Sustainable Development Goals and the concept of global citizenship.

This document is a guide for Engineers Without Borders Ambassadors delivering the workshop. Teachers and youth group leaders can also use it. It should be used in conjunction with the accompanying slides, slide notes and printouts. Please note that this resource is periodically updated. The date of the last update is on the inside front cover.

If you are not a teacher/youth group leader, please sign up to become an Engineers Without Borders Ambassador to be able to deliver this resource. Find out more and register here on our website. For any queries, please contact Engineers Without Borders UK directly using the email address: outreach@ewb-uk.org.

CONTENTS

THE WORKSHOP IN BRIEF

PUPIL'S LEARNING OBJECTIVES

- Understand the importance of clean water and that access to it is not equal
- Describe the role of an engineer in bringing about access to clean water
- Consider the challenges engineers face to give people around the world access to clean water
- Design your own model water filter

TEACHER'S EDUCATIONAL OBJECTIVES

- Incorporate global issues into classroom learning
- Provide careers related learning within subject lessons
- Hands-on activity that develops the pupils' ability to use cross curricular knowledge and skills, and work as team

SUITABLE AGE GROUP & SIZE

The session is designed for a standard school class of approximately 30 pupils with the class divided into groups of two to six pupils for the build activity. However, the content can be easily modified to suit smaller or larger groups. Please contact us for guidance on this.

This particular resource is suitable for KS3-4 (11-16 years of age, Years 7-11). There are separate resources suitable for upper KS2 (9-11 years of age, Years 5-6) on the Engineers Without Borders UK website.

WORKSHOP LESSON PLAN & RISKS

Overall workshop length is 100 minutes. To amend for a shorter session only do one of the activities (e.g. the build activity for science lessons, the case study and reflection activity for geography lessons) and present some of the Q&A rather than ask the pupils.

Workshop section description	Time (min)
INTRODUCTION: HOW WE USE & RELY ON WATER (slides 1-7)	
Introduction to the facilitator/s and to Engineers Without Borders UK. Starter activity to encourage pupils to think about how we use and rely on water and brief overview of session followed. *Encourages critical thinking & self-reflection.*	5
THE IMPORTANCE OF WATER AND HOW WE USE IT INDIRECTLY (slides 8-15)	
Encourages pupils to think about how essential clean water is to their lives. The importance of access to water is emphasised, supported by some key facts presented with context of their magnitude. Introduction of the concept that we use water indirectly, to manufacture the food we eat, the clothes we wear and the technology we rely on. Presentation of the amount of water required to produce the products we use, along with the link that we can save water by altering our consumption habits. *Introduces the idea that the way we live can affect the amount of water we use, even though it may be invisible.*	10
ACCESS ACTIVITY: WHAT IF I DON'T HAVE ACCESS TO CLEAN WATER? HOW DOES EVERYONE EVERYWHERE GET ACCESS TO CLEAN WATER? (slides 16-47)	
Introduces the notion of unequal access to safe water in the world and the impact this can have on people's lives. Card-sort activity, to explore how people around the world gain access to clean water through engineering. Explanation of what the Sustainable Development Goals are and how they are linked to the workshop topic. *Gives the class examples of how engineering can be used to give people access to clean water and improve their lives. Encourages them to think about how engineering can be globally responsible. Introduces a global dimension to understanding water access and raises the issue of global inequality. Highlights local and global initiatives addressing this.*	20
THE ROLE OF ENGINEERING (slides 48-67)	
Introduces the pupils to thinking about where water comes from. Discussion about water sources, water source technologies and getting access to water. Introduces the role that engineering plays in access to water, from water source technologies to getting access to water. Class discussion of the factors that may affect access. Optional activity to further explore factors which affect access to water. **KEY RISKS:** Use of scissors – only facilitator to handle scissors.	20

Teaches the class about what contaminants are, and how they can be classified. *Encourages critical thinking to discover where water comes from, the technologies used to collect & distribute it & raises the issue of water contamination. Encourages pupils to explore some of the reasons why people may not have access to safe water supplies and consolidate learning on the importance of safe water access.*	
BUILD ACTIVITY: BUILDING A WATER FILTER (slides 68-76)	
General principle of how sediment filters work is explained. Hands-on, creative team activity to build a small water filter. Filter performances are then tested. *Teambuilding activity encouraging critical creative thinking to understand and apply the principles of filtration. Discussion of performance issues and relevant design adjustments.* **KEY RISKS:** Sharp edge on cut-off plastic bottle – highlight risk to children. Messy materials (sand & water) – only facilitator to handle water. Materials requiring cutting (plastic bottle, cheese cloth) to be prepared beforehand by facilitators.	35
LOOKING AFTER WATER & WHAT YOU CAN DO (slides 77-81)	
Revisits the impact to people's lives when they do not have access to clean water. Explains that engineering can be used to ensure that everyone has access to clean water. Brief overview of water conservation actions individuals can undertake. Reiteration that water can be saved by changing our habits, such as the water used to produce food, clothes and technology. *This helps pupils understand how their actions can have an impact on the world and encourage self-reflection.*	5
REFLECTIONS ON LEARNING (slides 82-84)	
Recaps the learning objectives accompanied by quizzing the pupils on the key messages and lessons from the workshop. End of the workshop. Gives the pupils an opportunity to ask any questions they have about the workshop, STEM, or higher education.	5

GUIDANCE FOR ADJUSTING WORKSHOP LENGTH

LENGTHENING THE WORKSHOP TO 120 MINUTES

Increase the workshop length by spending more time on activities such as taking answers from pupils, designing and building the water filter, and taking questions at the end of the workshop.

DECREASING THE WORKSHOP TO 60 MINUTES

Save time by focusing more on talking through the slides, and asking closed questions to maintain pupil engagement, rather than open questioning and pupil discussion. As well as this, you can decrease workshop length by:

- Do not run the optional 'REFLECTION ACTIVITY' on **slide 56**.
- Do not cover removing contaminants, on **slide 66**.

SPLITTING THE WORKSHOP INTO TWO 60 MINUTE SESSIONS

LESSON NUMBER	SLIDES TAUGHT	LEARNING OBJECTIVES MET	TIME TAKEN (MINUTES)
1	1-58	Understand the importance of clean water and that access to it is not equal Describe the role of an engineer in bringing about access to clean water Consider the challenges engineers face to give people around the world access to clean water	50
1	81-84		10
2	1-4	Consider the challenges engineers face to give people around the world access to clean water Design your own model water filter	5
2	6-7		
2	59-80		45
2	82-84		10

PREPARATION

PRESENTATION

Familiarise yourself with the slides and accompanying slide notes. Know how long each section of the workshop should take and consider how you are going to communicate to the pupils. If you are delivering the workshop in a small team, decide how to split delivery of the sections up between you.

MATERIALS & RESOURCES

The activities are an important part of the workshop, so spend extra time ensuring you have all the materials for these well in advance of the workshop date. Printouts are also needed for the workshop and are available to download. A checklist is provided, so check carefully to make sure that you have all materials and resources before the scheduled workshop. You may wish to group activity resources so each group can easily access the resources at the beginning of each activity. Ask the school in advance if they can provide any of the materials or equipment for the workshop and inform them of the amount required.

ROOM SETUP

A normal classroom is fine for this workshop but check that it is okay to do the build activity in this environment, as it can get messy. Please be prepared to help clean up afterwards. Enquire about audio-visual facilities at the school as you will need to be able to present a PowerPoint slide show.

GETTING FEEDBACK

Ensure you know how you are going receive feedback. The guidance provided in these resources indicates how to get feedback from the pupils during the last stage of the workshop. Please request feedback from the teacher/youth group leader using these online forms before and after the workshop. See the Engineers Without Borders Ambassador's handbook for further guidance on asking for feedback from teachers/youth group leaders.

PHOTOGRAPHY

We would really like photos for our publicity materials and rely on you to send us photographs of your workshops to show our work in action. Ensure you have asked for permission for photography from the school and that you follow any procedures they have in place. Photographs should be high quality and preferably of landscape orientation. Submit any photos you take with permission to outreach@ewb-uk.org with captions to describe each of them.

MATERIALS & EQUIPMENT LIST

Read the activity notes to understand any preparation you need to do. You will need to calculate how much you need depending on the total class size and number of groups receiving the workshop.

Item	Number required
FOR PRESENTATION	
Laptop/computer connected to projector	1
Water for Everyone Everywhere PowerPoint presentation	1
Flip chart, A3 or A4 paper for starter	2 per group (optional)
FOR CASE STUDY CARD SORT	
Water for Everyone Everywhere Access Activity Printouts	Print out 1 worksheet per pair
Water for Everyone Everywhere Case Study Card Sort Printouts	1 set of cut cards per group
Envelope	1 per set of cards
FOR BUILD ACTIVITY: MAKING A WATER FILTER	
Water for Everyone Everywhere Build Activity Printouts	Print out 1 worksheet per group or per person
Pens/pencils	1 per pupil
Cut-off 2L plastic bottle	1 per group
Cups (plastic/card) to hold filtration materials	8 per group

Coarse gravel	Enough for 2 cups per group
Fine gravel	Enough for 2 cups per group
Coarse sand	Enough for 2 cups per group
Fine sand	Enough for 2 cups per group
Cheesecloth	1 x10cm square per group
Cotton wool ball	1 per group
Rubber band	1 per group
Contaminated water	Enough to test all water filters
REFLECTION ACTIVITY: WATER ACCESS ISSUES	
Water for Everyone Everywhere Reflection Activity Printouts	Print out enough for 1 card per group
Ball of string	1
Scissors	1
FOR REFLECTIONS ON LEARNING & GETTING PUPIL FEEDBACK	
Large sticky notes ('super' size if possible)	Enough for up to 4 per pupil
Large board for sticking the sticky notes on	1

ACTIVITY NOTES

CARD SORT ACTIVITY: HOW DOES EVERYONE EVERYWHERE GET ACCES TO WATER

The activity encourages pupils to engage with the information in each case study. The case studies each present a location, water access issue and solution that communities have employed.

Preparing the materials

- Read through all instructions as well as speaker's notes in **slides 28 - 43**
- Source the cards from the printouts document well in advance of the workshop
- Consider how many sets you will need (this is best as a paired activity)
- Make sure the cards are cut up and placed in envelopes in sets PRIOR to attending the workshop, to save time (you may wish to number the sets)

Delivery instructions

- Talk through the first example case study on **slides 29-32** and answer any questions about how the cards were matched
- Encourage pupils to sort the cards to decipher the story of each case study
- Prompt them to read all of the information on each card
- Use the slides to go through correct card matching and highlight the overall message of each case study

- Ask pupils to return the cards to the envelopes at the end of the activity

BUILD ACTIVITY: BUILDING A WATER FILTER

This activity allows pupils to explore the principles of water filtration, apply them and work in teams to build a miniature version of a sand water filter which is then tested.

Preparing the materials

- Read through all instructions as well as speaker's notes in **slides 68-76**
- Source all the materials and print printouts well in advance of the workshop
- Make sure the cheesecloth and plastic bottles are cut PRIOR to attending the workshop. This prevents the use of scissors by participating children reducing the risk of injury. If possible, protect the sharp edge of the plastic bottles using tape (e.g. electrical tape or duct tape)
- If possible, fill the cups with the materials before the workshop (leave the top third of the cups empty, to moderate spills, and stack them in a bucket or similar container to secure them), or before the pupils enter the classroom
- This reduces the risk of mess created by the children doing this themselves and saves time. You may also want to group the materials for each group to save time and confusion. Locate paper towels or other drying equipment to be able to respond quickly to spillages.

Delivery instructions

- Read out the information about the underlying principle of filtration from **slides 68-73**
- Read out the activity instructions to the class from **slide 74**
- Split the class into groups of between 2–5 pupils
- Give each group a worksheet to produce a labelled design their water filter (10min). Remind pupils of time limits
- Give each group their materials and tell them to get started making their filter. Remind pupils to follow their design sheets and reiterate the time limit for building activity (10-15 mins)
- Encourage the pupils throughout, highlighting skills they are showing that are important for engineering. Provide help where needed, referring back to filter principles. Keep the pupils to time
- When the time is up, move onto the instructions on **slide 75-76**
- After testing, encourage pupils to complete the evaluation section on their worksheet
- Lead by example by clearing up during and afterwards, leaving as little mess as possible

REFLECTION ACTIVITY: WATER ACCESS ISSUES

This activity allows pupils to consolidate their learning regarding the issues that arise due to lack of access to clean, safe water and explore some of the causes of this.

Preparing the materials

- Read through all instructions as well as speaker's notes on **slides 56-58**
- Source all the scenario cards and printouts well in advance of the workshop. Consider in advance how many cards you will need
- Make sure the printouts are cut up PRIOR to attending the workshop, to save time

Delivery instructions

- Take the group through the activity following the instructions on **slide 56**
- Encourage the pupils think about what they have learned through the session to analyse the challenges. Reassure pupils that there are no right or wrong answers
- Encourage the pupils throughout and provide help where needed. Keep them to time
- When time is up, ask one person from each group to present a summary of their analysis (limit this to 1 or 2 sentences to save time)

REFLECTIONS ON LEARNING & GETTING PUPIL FEEDBACK

This activity allows pupils to reflect on their learning from the session as well as enabling you to collect feedback from them about the key points that they have remembered.

Preparing the materials

- Read through all instructions as well as speaker's notes in **slide 82**
- Source all the materials well in advance of the workshop

Delivery instructions

- Read out the activity instructions to the class from **slide 82**
- Encourage the pupils throughout and provide help where needed. Keep them to time
- When the time is up, ask the pupils to bring up their sticky notes and add them to the board you have brought with you
- Clear up during and afterwards leaving as little mess as possible

ABOUT ENGINEERS WITHOUT BORDERS UK

Engineering is vital for human development and key to addressing urgent global issues such as the effects of climate change, resource depletion, increasing urbanisation and rapid population growth. Engineers Without Borders UK brings people, ideas and engineering together to respond to these complex issues. We work in sub Saharan Africa, southern Asia, Latin America and the UK to ensure that the engineers of tomorrow have the necessary skills and information to apply their knowledge in a globally responsible way. We work with individuals, local partners, the education sector and the engineering community. Together, we are ensuring that people everywhere have equal access to the benefits of engineering.

This resource is part of our strategic objective to inspire the next generation of globally responsible engineers. We want to broaden the profile of engineering and the wider understanding of the role it plays in society so that we attract a more diverse cohort of talent to the engineering sector and ensure that the next generation of engineers are able to apply their skills and ability in a globally responsible way. For more information please visit our website: www.ewb-uk.org

ACKNOWLEDGEMENTS

This workshop builds on our previous resource 'Water for the World' and sister resource 'Power for the World'. It is therefore the result of many years of collaborative effort between Engineers Without Borders UK, our volunteers, teachers and other partners such as Engineers Without Borders Canada, Arup and Practical Action. We'd like to thank everyone who has been involved to date and in particular our current donors – EuropeAid and the Alcoa Foundation – for helping to make 'Water for Everyone Everywhere' a reality.

This resource and the accompanying materials are available to download from: www.ewb-uk.org/water-for-everyone-everywhere.

This project has been funded by the European Union.