

PRIMARY LEVEL



FACILITATOR'S PACK

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



UK

ENGINEERS

WITHOUT BORDERS

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Last dated update of this document: 09 September 2019.

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

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OVERVIEW

Power for Everyone Everywhere is a workshop designed to encourage pupils to explore the challenges associated with access to clean, reliable electricity around the world. Pupils learn about the importance of electricity to people's everyday lives and the role that engineering infrastructure plays in the distribution of electricity. Pupils design, build and test their own model wind turbine 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 on our [website](#). For any queries, please contact Engineers Without Borders UK directly using the email address: outreach@ewb-uk.org.

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THE WORKSHOP IN BRIEF

PUPIL'S LEARNING OBJECTIVES

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

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 upper KS2 (9-11 years of age, Years 5-6). There are separate resources suitable for KS3-4 (11-16 years of age, Years 7-11) 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 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 ELECTRICITY (slides 1-9)	
<p>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 electricity and brief overview of the session. The importance of access to electricity is emphasised and used to emphasise the impact on the 1 billion people lacking access globally.</p> <p><i>Encourages critical thinking and self-reflection.</i></p>	10
ACCESS ACTIVITY: WHAT IF I DON'T HAVE ACCESS TO ELECTRICITY? (slides 10-21)	
<p>Introduces the notion of unequal access to reliable electricity in the world and the impact this can have on your life. Reflective activity, using printouts, to encourage pupils to think through the issue of lacking access to electricity. Summary of how lacking access can affect people's lives in many different ways.</p> <p><i>Introduces a global dimension to understanding electricity access and raises the issue of global inequality.</i></p>	20
THE ROLE OF ENGINEERING: GENERATING ELECTRICITY AND POWER RESOURCES (slides 22-29)	
<p>Introduces the role that engineering plays in generating electricity and selecting power resources for this process. Pupils are briefly informed that there are different resources to generate electricity and given examples of the electricity generation technology used for each resource. They are asked to consider whether resources are renewable or non-renewable in an activity, after recapping the definitions. Introduction to the link between fossil fuels, electricity provision and climate change.</p> <p><i>Encourages critical thinking to discover where electricity comes from, the technologies used to generate it and raises the issue of climate change.</i></p>	15
THE ROLE OF ENGINEERING: EXPLORING ACCESS (slides 30-34)	
<p>Optional group activity to recap on electricity access and discussion of the factors that may affect access. Presents a case study to introduce pupils to how other children in other countries are affected and have overcome issues of lacking electricity.</p> <p><i>Encourages pupils to explore some of the reasons why people may not have access to reliable electricity supplies and consolidate learning on the importance of reliable electricity access. Highlights local and global initiatives addressing lack of access to electricity.</i></p> <p>KEY RISKS: Use of scissors – only facilitator to handle scissors.</p>	10



BUILD ACTIVITY: BUILDING A WIND TURBINE (slides 35-38)

Hands-on and creative team activity to build a small wind turbine. Turbine blade performances are then evaluated when tested.

Team building activity encouraging critical creative thinking to understand and apply the principles of how wind turbines work. Discussion of performance issues and relevant design adjustments.

35

KEY RISKS: Use of scissors with card and cardboard – mitigate risk through use of safety scissors, advise children of the risks and maintain supervision of activity.

WHAT YOU CAN DO & LOOKING AFTER ELECTRICITY (slides 39-42)

Revisits the impact to people's lives when they do not have access to electricity. Explains that engineering can be used to ensure that everyone has access to electricity. Brief overview of electricity conservation actions individuals can undertake and written activity for pupils to identify what they have learned in the workshop.

5

Helps pupils understand how their actions can have an impact on the world and encourage self-reflection.

REFLECTIONS ON LEARNING (slides 43-45)

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.

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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 wind turbine, 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:

- Instead of having the 'WHAT HAPPENS IF I DON'T HAVE ACCESS TO ELECTRICITY' printout on **slides 10-11**, complete the spider-diagram on the board, using suggestions from the class.
- Cut **slide 22**, about generating electricity.
- Cut the pair activity on **slide 29** and instead talk through whether the power resources are renewable or non-renewable on the board, with class suggestions and discussion.
- Do not run the optional 'EXPLORING ACCESS ACTIVITY: ELECTRICITY' on **slide 31**.



SPLITTING THE WORKSHOP INTO TWO 60 MINUTE SESSIONS

LESSON NUMBER	SLIDES TAUGHT	LEARNING OBJECTIVES MET	TIME TAKEN (MINUTES)
1	1-32	Understand the importance of electricity and access to it is not equal. Describe the role of an engineer in bringing about access to electricity. Consider the challenges engineers face to give people around the world access to electricity.	50
1	43-45		10
2	1-4	Describe the role of an engineer in bringing about access to electricity.	10
2	6-9		
2	33-45	Design your own model wind turbine.	50

PREPARATION

PRESENTATION

Familiarise yourself with the slides and accompanying slide notes. Know how long each section of the workshop should take. 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. 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. Ensure pupils tidy as much as they can before they test their turbine. 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 to receive feedback. The guidance provided in these resources indicates how to get feedback from the pupils during the final section 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 photos to outreach@ewb-uk.org with captions to describe 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
Power for Everyone Everywhere PowerPoint presentation	1
Flip chart, A3 or A4 paper for starter activity	2 per group (optional)
FOR ACCESS ACTIVITY: WHAT IF I DON'T HAVE ACCESS TO ELECTRICITY?	
Access Activity Printouts	Print out 1 worksheet per person
FOR BUILD ACTIVITY: MAKING A WIND TURBINE	
Build Activity Printouts	Print out 1 worksheet per group
Pens/pencils	1 per pupil
Recyclable Paper Straws	10 per group
Card (A4 suggested)	10 pieces per group
Cardboard (A4 size suggested)	5 pieces per group
Sellotape	1 per group
Safety scissors	At least 1 pair per group
Cotton reel (without cotton if possible)	1 per group



'Turbine Tower'	1
Hairdryer (you might need an extension cable)	1
FOR EXPLORING ACCESS ACTIVITY (OPTIONAL): ELECTRICITY	
Exploring Access Activity Printouts	Print out 1 set of sheets
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

ACCESS ACTIVITY: WHAT IF I DON'T HAVE ACCESS TO ELECTRICITY

This activity allows pupils to reflect on either their own experience or use their imagination to understand what role electricity plays in our everyday lives and the impact of lacking access.

Preparing the materials

- Read through all instructions as well as speaker's notes in **slides 10-21**
- Source all the materials and print printouts well in advance of the workshop

Delivery instructions

- Read out the activity instructions to the class from **slide 10**
- Encourage the pupils throughout and provide help where needed. Keep them to time. When the task is complete conclude with **slides 12-21** and collect in all the worksheets (suggest the teacher could keep sheets for pupil exercise books)



BUILD ACTIVITY: BUILDING A WIND TURBINE

This activity allows pupils to explore the principles of wind turbine movement, apply them and work in teams to build a model wind turbine which is then tested.

Preparing the materials

- Read through all instructions as well as speaker's notes in **slides 34-38**
- Source all the materials and print printouts well in advance of the workshop
- Make your 'Turbine Tower'. This needs to allow the cotton reel at the centre of the pupil's turbines to attach to a rigid base for the hair dryer test. You can either make use of the school's own retort stands and clamps, make something to hold by hand, or build a free-standing base. To make something to hold by hand, the simplest option is to use a plank of wood (approx. 2.5cm deep, 4 cm wide, 40cm tall), drill a hole towards one end on the wide face and fix a pencil in the hole. Check your cotton reels can fit onto the pencil and rotate without resistance
- Either before you arrive or if there is time before the class enter the room, group the materials ready for the activity, to save time and confusion

Delivery instructions

- Read out the information about the underlying principles of wind turbine movement from **slide 34** and the activity instructions from **slide 35** to the class
- Split the class into groups of between 2-5 pupils
- Give each group a worksheet to produce a labelled design of their turbine blades (10min). Remind pupils of time limits
- After the designs are completed, give each group their materials and tell them to get started making their wind turbines. Remind pupils to follow their design sheets and reiterate the time limit for building (10-15 mins)
- Encourage the pupils throughout, highlighting skills they are showing that are important for engineering. Provide help where needed, referring back to turbine movement. Keep pupils to time
- When the time is up, move onto the instructions on **slides 37-38**
- 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



EXPLORING ACCESS ACTIVITY: ELECTRICITY

This activity allows pupils to consolidate their learning regarding the issues that arise due to lack of access to reliable electricity and explore some of the causes of this.

Preparing the materials

- Read through all instructions as well as speaker's notes on **slides 30-33**
- Source all the materials and print printouts well in advance of the workshop
- Make sure the printouts are cut up PRIOR to attending the workshop to save time
- When you arrive, identify which area of the room you can use for this activity

Delivery instructions

- Take the group through the activity following the instructions on **slide 31**
- Only you should use the scissors to cut the string
- Encourage the pupils throughout, provide help where needed and keep them to time
- When the activity is finished, ask the pupils to sit back down and move onto the summary on **slide 32**

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 on **slide 43**
- Source all the materials well in advance of the workshop

Delivery instructions

- Read out the activity instructions to the class from **slide 43**
- Encourage the pupils throughout, provide help where needed and 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 'Power for the World' and sister resource 'Water 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 'Power for Everyone Everywhere' a reality.



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



This project has been funded by the European Union.