WHAT IS POLLUTION?

SUPPORT MATERIALS

If you need further support on specific aspects of outdoor learning these materials can enhance the engaging experiences you are providing. They can support you as you design, plan and implement your curriculum. Outdoor learning is a great way to develop learners' integral skills (creativity and innovation, critical thinking and problem-solving, personal effectiveness, planning and organising). You will want to focus on why learning matters and ensure you are meeting your learners' needs.
These materials show a path that could be taken through the activity. This is not meant to be prescriptive. You should adapt your approach depending on your learners' needs and interests and your local area.

OVERVIEW

Learners consider what pollution is, its different types and pollutants. They carry out internet research to find out more detailed information before producing a class concept map. Learners spend time outdoors surveying the local area for evidence of pollution and produce a mind map to raise awareness. Using the evidence they have found, learners use a problem-solving process to reduce or eradicate the pollution. They then write a short online newspaper article to summarise how they tried to reduce local pollution. Learners consider global pollution in two forms, waste and light. Looking at waste data they contemplate how this could be reduced globally. Similarly, they suggest ways of reducing light pollution having considered global data and make a leaflet to encourage others to change their behaviour so that we can reduce light pollution.

CURRICULUM FOR WALES

Areas explored:

- Expressive Arts
- Health and Well-being
- Humanities
- Languages, Literacy and Communication
- Mathematics and Numeracy
- Science and Technology

Activity also incorporates aspects of cross-curricular skills outlined in the LNF and DCF.

RESOURCES

Internet enabled device and internet access.
Means of recording sights and sounds, e.g. tablet, smart phone, paper and pencils, etc.
Local maps or Google map and/or measuring equipment, e.g. pedometer, large sports tape measure.

DOING THE ACTIVITY

- Most tasks require learners to work in pairs or groups.
- Encourage learners to share their ideas, and through open questioning, explain and justify their ideas when possible. Focus questions have been suggested to guide learners through the tasks.
- Some tasks might be more effective if pairs or groups of learners have access to an internet enabled device.
- When taking learners outdoors, it is essential that the Countryside Code is adhered to and any relevant risk assessments have been carried out with risks mitigated.

TASK 1

WHAT DO WE MEAN BY 'POLLUTION'?

Explain to learners that this task should help them to understand what pollution is and the different types of pollution on Earth.

Screen 3

The first screen tries to activate learners' prior knowledge and understanding. Invite learners to discuss the questions posed.

Focus questions

- What do you think pollution is?
- Where have you heard the term 'pollution'? What was it referring to?
- When, if ever, have you used the term 'pollution'? What were you referring to?
- What types of pollution have you heard about? Where did you hear these types?

You could ask learners to share their ideas with the class.

Screen 4

Invite learners to go think of 10 words they might use to describe pollution. Then, to use some of the words in the sentence 'Pollution is...'. Their sentence should explain to others what pollution is but could be creative/descriptive and/or scientific/factual. Ask learners to share their sentences with the class.

Screen 5

Ask learners to discuss the questions posed to compare their definition with the National Geographic's definition of pollution:

'Pollution is the introduction of harmful materials into the environment.'

Focus questions

- How does the definition compare with your ideas?
- How is the definition different?
- How is the definition similar?

Screen 6

Share the main types of pollution – air, water, noise, land, light, radioactive, thermal (heat) - with learners and ask them what they already know about each type.

Focus questions

- Which of these types of pollution have you heard of before?
- What do you know about each type of pollution?

Screen 7

Invite learners to study the photograph of the Port Talbot Steel Works and make decisions as to the types of pollution they might produce.

You could ask learners to share their ideas with the class.

Screens 8-10

Introduce learners to the term 'pollutant' as in something that causes pollution. In small groups, ask them to organise themselves to do an internet search to find out information about pollutants.

You could ask learners to think about the quality of their internet search by considering the questions posed:

Focus questions

Before researching...

- Which search engine will you use? Why have you chosen this one?
- What search terms could you use? Which are the best? Why?
- What type of sites will be the best to look at? Why?

When assessing information/data...

- How do you know the information/data is reliable?
- Could the information/data be biased? Why do you think that?
- How reliable do you think the information/data is? How could you find out?

Invite each group to use the QuADS grid to plan and carry out their search and then complete the table.

Ask learners to share their pollution/pollutants findings with the class.

Screen 11

Invite learners to work together as a class to produce a display about pollution as a concept map. For more information on concept maps, visit: How to Make a Concept Map: Beginner's Guide (& Templates) and Classroom Strategies - Concept Maps.

A concept map is a diagram that depicts relationships between concepts. A mind map simply links ideas, whereas a concept map uses descriptions on the links to show the relationship. For example, a mind map might link water pollution with plastics. A concept map would describe how plastics (pollutant) become a form of water pollution possibly from food packaging/microplastics in cleaning products, etc. This information is written on the line that joins the water pollution and plastics.

The display should show types of pollution, examples of pollutants and how each pollutant is made/where it comes from. It should include images to highlight learners' ideas.

You could display the concept map in a prominent place in the school.

Screen 12

Invite learners to reflect on the whole task by completing at least one of the sentence starters and share these in class. The sentence starters are:

I understood better when...; The thing that really helped me today was...; One thing we did today that made me realise...; To improve I could...; After reading, I...; I could use this strategy when...; After talking to...; The next time I could...; The thing I found most difficult was...; One idea/thing I still don't understand is....

TASK 2

WHERE IS THERE POLLUTION IN THE LOCAL AREA?

Explain to learners that they will spend some time in the locality around school to try to find evidence of local pollution. Very simply, this could be surveying the school grounds and finding litter, looking at local industrial chimneys from afar, discarded building materials, etc. However, if you know of any areas that would provide a more varied selection of pollution, e.g. a local river bank or beach or wasteland around industry, the learner outcomes might be richer.

Screen 3

Before they go out, ask each group to discuss the questions posed.

Focus questions

- How are you going to record evidence of pollution?
- What types of pollution and pollutants do you expect to find?
- What do you think would be the most useful areas to visit? Why?

You could ask learners to share their ideas with the class.

Screen 4

Explain to learners that they will need to:

- take photos, video or audio clips or make sketches to show the pollution
- use a map or take measurements so they can pinpoint where the pollution is
- make notes about what the pollutants are and where they might be coming from.

Also, explain to them that when they come back, each group will be tasked with producing a mind map to raise awareness of pollution in the local area.

Screen 5

Take learners outdoors to find evidence of pollution and to take measurements, photos, video/audio clips and/or sketches to use in their mind map.

Screen 6

Invite learners to use the map to find where they saw evidence of pollution. They could take screenshots to use in their mind map. They might also wish to use the map to find out/show where the pollution/pollutants might be coming from.

To scaffold this you could use the questions posed.

Focus questions

- How could you use the map to show where the pollution was found?
- How could you use the map to find out where the pollution/pollutants might be coming from?
- Why might using a map be useful to raise awareness?

Screen 7

Ask each group of learners to draw a mind map to raise awareness of pollution found in the local area. Remind them that their mind map should include the types of pollution and pollutants and what could be causing the pollution.

Share the mind maps by displaying them in class.

TASK 3

HOW CAN WE SOLVE LOCAL POLLUTION PROBLEMS?

Now that learners are aware of pollution in their local area, explain to them that they are now going to look at ways of solving these problems. This task takes learners through a generic problem-solving process. It may be better for learners, in their pairs, to select one type of pollution or pollutant so that each pair is looking at different things.

The whole process of solving the problem could take several weeks or even months, depending on the type of pollution/pollutant selected and how deeply learners consider what causes it. For example, emails to a local council could take time for responses to be received and even more time before the matter is discussed and the council takes action.

Screen 3

Ask learners to clarify their thoughts by discussing the questions posed.

Focus questions

- Which type of pollution or pollutant are you going to investigate further?
- What do you already know about the pollution or pollutant?
- How can you phrase your investigation as a problem, e.g. 'How can we solve the problem of ….'

You could ask learners to share their ideas with the class.

Screen 4

Introduce learners to the problem-solving process.

Screen 5

Ask learners to consider the questions posed to try and better understand the problem.

- What are you trying to find out?
- How can you restate the problem in your own words?
- How can you draw a picture or a diagram that might help you understand the problem?
- Is there enough information to enable you to find a solution?
- What else do you need to know? Why? How will you find out?

Screen 6

Invite learners to spend some time brainstorming ideas for solving the problem by considering and using the suggested strategies - Guess and check or trial and error; Make an orderly list; Eliminate possibilities; Consider special cases; Use direct reasoning; Look for patterns; Draw a picture; Solve a simpler problem; Use a model; Work backwards; Use your imagination to develop creative ideas around the problem.

Screen 7

Invite learners to select the best idea and plan how they will solve the problem. Allow time here for planning. Then, to share their plans with members of their group (from Task 2) to get feedback on:

- which parts of the plan they think will work
- possible improvements to the plan.

Then, ask learners to make any amendments to their plan following the feedback.

Screen 8

Ask learners to carry out their plan. As stated earlier, this could take some time. Stress the importance of modifying their plan if something isn't working and to make a note of any changes made.

Screen 9

Allow learners time to reflect on their plan and to consider how well it worked and any other improvements needed to better solve the problem. This is important because it will help them to predict relevant strategies to use to solve future problems. Ask learners to discuss the questions posed.

Focus questions

- Which parts of the plan worked?
- Which parts of the plan didn't work as well? Why?
- How could we change the plan to make it work better?
- How well did we solve the problem?
- What else could we do to help us better solve the problem?

Screen 10

Invite learners to write a short online newspaper article to summarise how they tried to reduce local pollution. Suggest that they use images to support their text and information about why they focused focus on this pollution or pollutant, what they did, how well they solved the problem and any next steps needed to reduce the pollution/ pollutant.

TASK 4

HOW CAN WE SOLVE GLOBAL POLLUTION PROBLEMS?

There are many global pollution problems that could be included in this task. However, waste generation and light pollution are simpler to interrogate globally than others. The activities relating to the designated landscapes include other areas of global pollution, as well as looking at local pollution/pollutants in that designated landscape.

Screen 3

Show the video Dennis' story about air pollution in the informal settlement of Mukuru in Nairobi, Kenya (about 2 minutes). Although the video talks about air pollution, there are many other types of pollution/pollutants shown. Ask learners to discuss the questions posed.

Focus questions

- What types of pollution and pollutants does the video show?
- What advice would you give to reduce pollution here to:
  - local people
  - the government?

You could ask learners to share their ideas with the class.

Screen 4

Invite groups of learners to produce a mind map to show their ideas about global waste by discussing the questions posed.

Focus questions

- What is waste?
- What materials form waste?
- Why are these materials thrown away or not used?
- Where are these materials from?

Most learners will probably discuss physical waste in terms of rubbish. However, some might discuss air pollution, farming run-off or sewage in rivers, etc. from their earlier work. In the next three screens, learners will consider physical waste.

You could ask learners to share their ideas with the class.

Screen 5

There are two screens that consider physical waste globally from towns and cities (municipal waste). The data provided compare countries. The first screen shows the top 20 countries for generating municipal waste produced per year. Ask learners to discuss the questions posed and share their ideas with the class.

Focus questions

- What surprises you about the data?
- What correlation(s) could you make between waste production and what you already know about this country?

Screen 6

The second screen shows the top 20 countries for recycling per year. Ask learners to discuss the questions posed and share their ideas with the class.

Focus questions

- Which countries appear on both charts?
- Which countries appear on the recycling chart but not on the waste chart? Why do you think that is?
- Which countries do you think need to focus more on recycling? Why?

Screen 7

The final screen about waste considers how the population might affect waste generation and how waste generation might be minimised. Ask learners to discuss the questions posed.

Focus questions

- How do you think the world population impacts on the quantity of waste produced?
- How could we minimise the waste produced?

Then, invite learners to use their discussions to write a Tweet/X to encourage others to reduce waste production – maximum 280 characters.

You could ask learners to share their Tweets/X with the class.

The first screen should be viewed without learners knowing they are going to study global light pollution.

Screens 8-9

Invite pairs of learners to generate good questions to try and work out what the image is showing them using the question starters. Then, to share their questions in a group and try and work out answers to them. It may be at this point some research is needed. However, it might be better to just continue with the task as they will find out more about the image as they do so.

Screen 10

Show learners the description of light pollution and ask them to discuss the questions posed.

Focus questions

- How much light pollution is there in your town? Why?
- What might cause light pollution locally?
- What effects could light pollution have on plants and animals? Why?

You could ask learners to share their ideas with the class.

Screen 11

This screen gives the World Atlas of Night Sky Brightness, a computer-generated map based on thousands of satellite photos, which was published in 2016. Invite learners to interrogate the map to decide upon where the most and least light pollution is in the UK and in the world. To do this, they will have to work out what the colours mean.

Screen 12

This screen is a video of the world from Science on a sphere, National Oceanic and Atmospheric Administration (NOAA) showing light pollution (just over 2 minutes) and includes a key. Ask learners to read the information in the key to make sense of the video. You could ask many questions about the video, relating to the key and specific countries. However, it is always interesting to see what learners make of a new representation. So, asking them what surprises them could lead to many ideas, e.g. the proportion of land to water, the greater amount of light pollution in the northern hemisphere, how some tiny islands have light pollution, etc.

You could ask learners to share their ideas with the class.

Screen 13

Go through the text on screen to find out the impact of light pollution on organisms. They will need to use some of this information as they develop their leaflet about light pollution.

Screen 14

Ask learners to read the article from the charity Bugs Life about light pollution. Then, to discuss the questions posed.

Focus questions

- How can we reduce light pollution:
  - from our home
  - from our school
  - from our town
  - globally?

You could ask learners to share their ideas with the class.

Screen 15

Explain to learners that we can all play our part in reducing global light pollution and that many small changes could have an impact on the problem.

Invite pairs of learners to make a leaflet to encourage others to change their behaviour so that we can reduce light pollution. Before they start, ask learners to consider and discuss what makes a good leaflet. You could give learners examples of leaflets or review some online ones so that they understand what makes a leaflet good. They could use these good features as their success criteria. Suggest that learners will need to include images to engage the reader, reasons as to why we need to reduce light pollution and examples of what we can do to reduce light pollution.

Screen 16

This screen gives a reflection triangle for learners to consider the strategies they used to make their leaflet. Invite learners to start at the base of the triangle and think about the ways they worked: individually, groups, online, paired work. Then, to consider the strategies they used from: reading, researching, drawing, reviewing classifying, discussing, making prototypes, using models, using examples, making lists. They can also suggest other strategies used. Finally, ask learners to consider which strategies worked the best. This latter information will be useful for similar future activities.