HOW SAFE IS SEA SWIMMING IN PEMBROKESHIRE COAST NATIONAL PARK?

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

In this activity, learners will learn about sea (marine) pollution and have the opportunity to assess the quality of sea water from a local beach as if they are Blue Flag assessors. They will explore how runoff into the sea becomes polluted and produce a Sway to give advice as to the safety of swimming in the sea at their local beach. They will learn more about plastic and chemical pollution before developing a campaign to either make people aware of sewage sea pollution or try to reduce sewage sea pollution.

CURRICULUM FOR WALES

Areas explored:

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

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

RESOURCES

Internet enabled device and internet access.
Access to Find out what every symbol means on an OS Explorer map - OS GetOutside.
Means of taking water samples – small clean plastic bottles.
Means of testing water for nitrates, pH (acidity/alkalinity) – simple testing strips for seawater tropical fish tanks will suffice.
Resources for learners to carry out their campaign to either make people aware of sewage sea pollution or try to reduce sewage sea pollution.

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.
- 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

HOW CLEAN ARE PEMBROKESHIRE'S BEACHES?

Explain to learners that this task should help them to understand more about sea (marine) pollution. They will have the opportunity to assess the quality of sea water from a local beach as if they are Blue Flag assessors.

Screen 3

Ask learners to discuss the questions posed to activate their knowledge and understanding about pollution.

Focus questions

- What do you think pollution is?
- Where have you seen pollution? What did it look like?
- Where was the pollution from? How do you know?
- What different types of pollution have you seen or heard about? What are they?

Screens 4-5

Invite learners to give some synonyms for pollution and type them in the box. The screen, on click, then gives them a few synonyms that they can compare with their own.

Screen 6

This screen gives a photograph of pollution. Ask learners to describe what they can see and type it in the box.

Screen 7

The image is given again, but this time learners are reminded of the synonyms from screen 5 and asked to think back to their own synonyms before reviewing their description of the image to improve it.

Screens 8-9

The first screen gives another image of pollution and asks learners to describe it. The next screen asks learners to compare their description with that of another pair. Then, to review their own description to improve it.

Screen 10

Here pollution is defined and the term ‘pollutants’ is introduced. Ask learners to discuss the question posed and list their ideas.

Focus question

- Which pollutants do you think might cause sea pollution?

Screen 11

This screen defines the two types of sea (marine) pollution as rubbish and chemical, explaining what each is and how it gets into the sea.

Screen 12

Invite learners to look at the map of Pembrokeshire Coast National Park and discuss the questions posed.

Focus questions

- Where do you think you would find the most pollution? Why?
- Where do you think you would find most rubbish pollution? What types of rubbish do you think you would find? Why?
- Where do you think you would find the most chemical pollution? What types of chemical pollution do you think you would find? Why?

Screen 13

This screen introduces the Blue Flag programme and describes what it is. It states that in 2023, Pembrokeshire had 10 Blue Flag beaches. Invite learners to discuss the question posed.

Focus question

- Which of Pembrokeshire's beaches do you think won a Blue Flag in 2023?

Ask learners to check their ideas, by visiting Wales Coast Awards - Keep Wales Tidy, using the navigation tools on the map to discover the 10 beaches awarded a Blue Flag.

Screens 14-15

Explain to learners that in 2023, Wales had 25 Blue Flag beaches. However, since 2021, Wales has lost 20 Blue Flags. Ask learners to discuss the questions posed.

Focus questions

- Why do you think Wales has lost these Blue Flags? What might have caused this? Why?
- Thinking of the criteria for being awarded a Blue Flag (environmental, educational, safety, access), which criteria do you think the beaches might have failed on? Why?

The second screen tells learners that, in fact, many local authorities in Wales did not actually apply for a Blue Flag in 2022 and 2023 due to budget cuts and the time taken to complete an assessment. Therefore, although some beaches no longer have a Blue Flag they might well be just as good as before.

Screen 16

Explain to learners that the Blue Flag criteria for bathing water quality includes regular water sampling and analysis.

At least one sampling point should be where there are the most bathers. If there are potential sources of pollution, e.g. near streams, rivers, stormwater outlets, etc. additional sampling points are needed.

Water samples should be analysed for:

- bacteria (*E.coli* and *Streptococci*)
- colour, transparency and turbidity
- acidity/alkalinity.

In addition, water should be observed for physical objects, e.g. floatables - tar residues, wood, plastic articles, bottles, containers, glass, etc.

There should be no oil film on the surface and no odour detected.

At this point, you may need to check their understanding of faecal bacteria, turbidity and pH.

Screen 17

Explain to learners that they are going to a local beach to check the bathing water quality, as a Blue Flag assessor. Point out to them that they will not be able to test for bacteria as this is very difficult to do for seawater and requires a laboratory. However, they could test for nitrates as indicators of pollution from sewage or fertilisers, etc. Invite them to plan what they are going to do by discussing the questions posed.

Focus questions

- What water samples will you need to take?
- Where will you take your water samples from? Why?
- What analyses will you need to do on your water samples?
- How else are you going to test the quality of the seawater? What will you look for? How will you record what you see or smell?

Screen 18

Take learners to a beach to take their seawater samples and make their observations.

Screen 19

Either on the beach or back in school, ask learners to analyse their samples, then discuss the questions posed.

Focus questions

- What did you find out about the seawater quality of your local beach?
- How confident are you of your results? Why?

Invite learner to write a Tweet/X to tell others about the cleanliness of your local seawater. Remind them that they only have 280 characters.

TASK 2

HOW DO POLLUTANTS GET INTO THE SEA?

Explain to learners that this task will support their understanding of polluted runoff into the sea and enable them to produce a Sway to give advice as to the safety of swimming in the sea at their local beach.

Screen 3

Remind learners that when testing for a Blue Flag, one of the water sampling sites needs to be near any potential source of pollution, e.g. near streams, rivers, stormwater outlets, etc. Ask learners to discuss the questions posed.

Focus questions

- Why do you think a stream or river flowing into the sea might carry pollutants?
- What types of pollutants might a stream or river carry? Why?
- Why do you think a stormwater outlet might carry pollutants?
- What types of pollutants might a stormwater outlet carry? Why?

Screen 4

Show learners the animation of how water runoff gets into the sea and ask them to discuss the questions posed.

Focus questions

- What pollutants do you think are in the runoff from each area? Why?

Screen 5

Explain to learners that they are going to do some online research to find out the pollutants that come from each type of runoff – industrial, agricultural, residential and roads.

Invite them to think about...

- Which search engine or AI will you use? Why?
- What are the key search terms/prompts to use? What do you want to find out?
- What type of websites will be the best to look at, why?

Then, to make a mind map to show their findings.

Screen 6

Explain to learners that the more it rains, the more runoff there will be into rivers and therefore into the sea. Invite them to read the first part of the article from Dŵr Cymru - Combined storm overflows (CSOs). Then, to discuss the questions posed.

Focus questions

- What happens when there is too much rain? Why?
- Why do you think new houses have separate pipes for sewerage and rainwater?
- What do you think are the disadvantages of CSOs? Why?

Screen 7

Explain to learners that Dŵr Cymru has developed a Storm overflow map giving near real-time information about storm overflow activity. Ask learners to access the map and select 'view the map in a new window'. Then, to discuss the questions posed.

Focus questions

- Where is the nearest place to school where the storm overflow is currently operating? How long has it been operating for?
- Find the nearest beach to your school. When did the storm overflow last discharge sewage into the sea and for how long?
- How do you think this information is helpful to sea swimmers?
- How do you think these storm overflow data will change due to climate change? Why?

Screen 8

Explain to learners that there has been much press recently about storm overflow sewage in river and seawater. Invite them to create a Sway to answer the question:

- What advice would you give to someone who wanted to swim in the sea at your local beach?

To support their thinking, ask learners to discuss the questions posed.

Focus question

- Do you need to do any more research on this topic? If so, what do you need to find out?
- What information will you give in your Sway? How will you give this information?
- What images will you use for your Sway? Why?

Screen 9

This screen gives instructions for using Sway.

- Login to your Hwb account and access Office 365. Find and open Sway or go to https://sway.office.com/.
- Click Create new.
- A Sway card will appear, now add a title to your Sway.
- Click Background image. Sway will begin to search for images relating to your title. These will be displayed on the right-hand side. Click the category that suits your title. Choose an image and drag and drop on to your title card. You can search for videos in the same way.
- Now click Play... Sway will use algorithms based in graphic design to suggest the appearance.
- Practise changing the graphic design.
- Click on + to add other images with text to include what you have found out about swimming in the sea at your local beach.

Share your Sway with the class.

Screen 10

Ask the class to feedback on:

Two things in the Sway they thought were good and why.

One thing that could be better in the Sway and why.

TASK 3

HOW CAN WE MINIMISE SEA POLLUTION?

Explain to learners that they will learn more about plastic and chemical pollution before developing a campaign to either make people aware of sewage sea pollution or try to reduce sewage sea pollution.

Screen 3

Show the video How did we get to a world full of plastic? - BBC (about 2 minutes). Then, ask learners to discuss the questions posed.

Focus questions

- How are plastics made?
- Why are plastics so important in our lives?
- What would your world look like without plastics?

Screen 4

Share the facts about plastic pollution and the length of time some items take to decompose. Then, ask learners to discuss the question posed.

Focus question

- Why do you think different plastic items take different times to decompose?

Screen 5

Explain to learners that as plastic decomposes it breaks down into smaller particles called microplastics. Invite them to research online to find out more about microplastics and to answer the questions posed.

Focus questions

- Where do microplastics come from?
- How big are microplastics?
- Where are microplastics found?
- What harm can microplastics do?
- How could we remove microplastics from the sea?

Invite learners to make a digital poster to show their findings.

Screen 6

Ask learners to discuss with a partner changes that could be made to minimise plastic pollution by...

- you
- your family
- your school?

Then, to list five changes that could be made to minimise plastic pollution.

Invite learners to try to implement all these changes and report back after a week as to how successful they have been.

Screen 7

This slide introduces chemical pollution and gives three types that will be explored in the following screens - fertiliser on farms, sewage outflow, industrial waste.

Screen 8

Explain to learners that fertilisers contain nitrogen and phosphorus-based chemicals. In the sea these chemicals promote the growth of algal blooms (eutrophication), which can be toxic to wildlife and harmful to humans. Blue-green algal blooms discolour the water, form scums, produce unpleasant tastes and odours and reduce the water quality. Decomposing algae can cause depletion of oxygen and so cause fish to die. Ask them to discuss the questions posed.

Focus questions

- Why do fish die if there isn't enough oxygen in seawater?
- Have you heard of blue-green algal blooms before? If so, where?
- Freshwater East and Bosherston Lakes have had blue-green algal blooms in the past. What do you think a warning sign would have said? Why?

Screen 9

Explain to learners that sewage pollution in the sea can also cause huge algal blooms as it contains about 40% more nitrogen-based chemicals than agricultural runoff pollution.

Sewage also contains bacteria that can be harmful, e.g. *E.coli* and *Streptococci*.

Surfers against sewage have a real-time map to track sewage discharge and pollution risks around the UK. Ask learners to access the map Sewage pollution alerts - Surfers Against Sewage and find where there are sewage issues in Pembrokeshire.

Screen 10

Explain to learners that across the world there are many causes of sewage pollution in the seas:

- inadequate and obsolete infrastructure (pipes, etc.)
- cruise ships dumping sewage into the seas
- flooding
- improper treatment at sewage treatment plants
- lack of sanitation facilities (e.g. toilets)
- lack of investment in preventing sewage pollution by governments and water companies.

Ask learners to discuss the questions posed.

Focus questions

- What do you think are the main reasons for sewage pollution in Pembrokeshire? Why?

Screen 11

Tell learners that they are going to create a campaign to try to minimise sewage pollution of the sea in Pembrokeshire. Also, that the most effective campaigns are clear and call for simple direct action.

Screen 12

Ask learners, in small groups, to think of their target audience for the campaign by discussing the questions posed.

Focus questions

- What type of people will you target in your campaign? (e.g. school friends, family, neighbours, whole school, water companies, local councillors, county councillors, Assembly Members, Members of Parliament, local people, Welsh people, people in the UK and beyond)
- Why have you selected these people?

Screen 13

Describe the problem-solving process learners will use for their campaign.

Screen 14

Starting with 'Identify the problem', invite learners to frame their campaign in terms of the problem to be solved. Then, to decide whether they are going to make people aware of sewage sea pollution or try to reduce sewage sea pollution.

Screen 15

Moving on to 'Understand the problem' ask learners in their groups to discuss the questions posed.

Focus questions

- What are you trying to do?
- What do you know about the focus of the campaign?
- How can you restate the focus in your own words?
- How can you draw a picture or a diagram that might help you understand the focus?
- Do you have enough information about the focus of your campaign?
- What else do you need to know? Why? How will you find out?
- Who is the audience for your campaign? What will the audience need to know and understand?

Screen 16

To 'Consider solutions' ask learners to brainstorm their ideas as to how they could make people more aware of sewage sea pollution or try to reduce sewage sea pollution. The screen suggests several strategies learners could use to do this.

Screen 17

Ask each group to select the best idea and 'Devise an action plan' for how they will make people more aware of sewage sea pollution or try to reduce sewage sea pollution.

Then, to share their action plan with another group asking the group to:

- Say which parts of the plan they think will work
- Suggest how it could be improved.

Once feedback has been received, ask learners to make any amendments they think are needed to improve their plan.

Screen 18

Ask learners to 'Carry out the action plan' to try to make people more aware of sewage sea pollution or try to reduce sewage sea pollution. Tell them that if part of their plan doesn't work, change it as they carry it out.

Screen 19

Invite learners to 'Reflect' on their outcomes by discussing the questions posed.

Focus questions

- How well have we made people more aware of sewage sea pollution or tried to reduce sewage sea pollution?
- How do we know?

Screen 20

Ask learners to 'Reflect' on processes in their plan and to take time to reflect and look back at what they have done, what worked and what didn't. Explain to them that doing this will enable them to predict relevant strategies to use to solve future problems. To support their thinking, ask them 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?