WYE VALLEY - FROM SOURCE TO SEA...

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 find out about their local river in terms of its source, journey, flood risks, health, etc. They produce a short presentation for younger learners to showcase their findings. Learners explore the water cycle and how water flows relating this learning to a river's journey and to how a river causes erosion, transportation and deposition. They learn about the importance of monitoring rivers before going out to measure and calculate the river discharge (rate of flow – cubic metres per second) of a local river. Finally, learners study the River Wye, looking at how it was used historically compared with today. Then, they produce a digital poster to show their findings.

CURRICULUM FOR WALES

Areas explored:

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

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 photographs, e.g. smart phones, tablets, cameras.
Means of simply measuring a river, e.g. large sports tape measures, pedometer, metre rules.
Means of carrying water, e.g. large plastic containers and jugs.
Means of changing the surface for water flow, e.g. soil/sand/grit/concrete, etc.
Means of blocking water flow, e.g. big stones, small stones and soil/sand.
Hose pipe, if required, to continue to fill containers with water.
Means of measuring river discharge - width: string, large sports tape measures, depth: metre rules and long sticks, velocity: dog biscuits, stop watches, large sports tape measures.

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

WHERE IS THE NEAREST RIVER?

Explain to learners that this task should help them to understand more about their local river in terms of its source, journey, flood risks, health, etc. They will produce a short presentation for younger learners to showcase their findings.

Screen 3

Invite learners to follow this link to explore the rivers in Wales: Data Map Wales - Rivers. Ask learners to find where they live on the map and discuss the questions posed.

Focus questions

- Which river is nearest to where you live? Why do you think that?
- What do you know about this river? How do you know these things?
- Where does this river start? How do you know that?
- Where does this river end? How can you tell?
- Which other rivers are near where you live?
- What do you know about these rivers?

Invite them to draw a mind map to show their findings.

Screen 4

Explain to learners that a source is the place where a river begins. A river's source can come from different places, e.g. underground springs, glaciers, lakes. Many rivers start in mountains or hills. When rain falls on steep slopes, the water runs across the surface and collects into small streams.

Ask learners to use the link again Data Map Wales - Rivers and discuss the questions posed.

Focus questions

- Where is the source of your local river? Why do you think this?
- Where does the river end? How can you tell?
- What villages and towns does the river pass through?
- How long is the river?
- What landmarks does the river pass by? Why do you think it passes by these?
- How else can you describe the path of this river? Why do you think it takes this path?

Invite learners to add their findings to their mind map.

Screen 5

Invite learners to carry out an internet search to find other information about their local river and to discuss the questions posed.

Focus questions

- What other information shall we look for, e.g.
  - depth of the river near where you live and at other points
  - flood risks near where you live and at other points
  - fish and other animals that live in the river
  - any risks to the river's 'health'?

Invite learners to add their findings to their mind map.

Screen 6

Inform learners that they are going to visit your local river to gather more information.

They will use this information and their mind map to create a short digital presentation about their local river for younger learners in your school. Ask them to discuss the questions posed.

Focus questions

- What further information could you find and collect during a visit? Why do you think that?
- What measurements could you safely take? How do you know?
- How will you take any measurements? What equipment will you need? Why?
- What could you take photographs of? Why? How could you use these in your presentation?
- What could you take audio or video of? Why? How could you use these in your presentation?

Screen 7

Take learners outside to collect further information about their local river.

Screen 8

Back in school, ask learners to use their mind map and any further information they have collected to create a one-minute digital presentation to showcase their local river.

Remind them to think about...

- What your audience of younger learners will find interesting.
- How you might need to adapt the language you use for younger learners.
- How you will ensure your presentation is only one minute long.

Screen 9

Ask learners to present their information about their local river to younger learners.

TASK 2

THE RIVER JOURNEY

Explain to learners that they are going to explore the water cycle and how water flows, relating this learning to a river's journey and to how a river causes erosion, transportation and deposition.

Screen 3

Invite learners to sketch their ideas about the water cycle, adding words to explain what is happening. To help them develop their ideas, ask them to discuss the questions posed.

Focus questions

- What do you think the water cycle is? Why do you think that?
- What do you think happens to rain after it falls on the Earth? Why do you think that?
- Where does the water from a river go after it flows into the sea? How do you know?
- What do the words 'evaporation' and 'condensation' mean? Why do you think that? How do they fit into the water cycle?

Screens 4-5

Ask learners to try to complete the water cycle by putting the text in the correct place.

Screen 6

Ask learners to look at the river in the photograph and to discuss the questions posed.

Focus question

- Why do you think it is this shape?
- Why doesn't it flow in a straight line? How do you know that?

Screen 7

Inform learners that they are going to go outside with some containers of water to explore how water flows. Before they go outside, ask them to develop some hypotheses (intelligent guesses) about how water flows by discussing the questions posed.

Focus questions

- What happens to water on a flat surface? Why do you think this happens?
- What happens to water on a sloping surface? Why do you think this happens?
- What happens to the flow of water when you increase the gradient of the slope? Why?
- On which type of surface will water flow the best? Why?
- What happens to water when its flow is blocked by something solid? What happens if you increase the volume of water? What happens if you increase the speed of flow?
- What happens to water when it is blocked by something like soil or sand? What happens if you increase the volume of water? What happens if you increase the speed of flow?

Please ensure learners aren't somewhere they can cause damage. They should pour water onto flat and sloping surfaces of different materials. They will need smooth and rough surfaces – soil/sand/grit/concrete, etc. For the 'blockages' they can use big stones, small stones and soil/sand. You will also probably need a hose pipe to keep topping up the containers if you are not near a water source.

Screen 8

Take learners outside to explore how water flows.

Screen 9

Invite learners to look back at their hypotheses and discuss the questions posed.

Focus questions

- What did you observe?
- How correct were your hypotheses?
- Why do you think the water flowed downhill? Where is it trying to go? Why do you think that?

Screen 10

Explain to learners that rivers shape the land by moving material from one place to another through:

- erosion
- transportation
- deposition.

Ask them to discuss the questions posed.

Focus questions

- What do you think each of these words mean?
- How can you include each word in a sentence about rivers?

They can type their sentences in the box provided.

Screen 11

Inform learners that they will carry out research to find out about one of these processes - erosion - transportation - deposition - and draw a diagram to share with the class. You could split the class into 6 groups – 2 groups do each process. BBC Bitesize has details of these processes at Rivers are part of the water cycle. Learn about river processes and landforms in this geography guide for students aged 11 to 14 from BBC Bitesize.

Ask learners, in their groups to discuss the questions posed.

Focus questions

- Which process are you researching? What do you know about it? Where will you search for information? Why?
- What do you need to include in your diagram? Why?
- What will be the best way to present the information? Why do you think that?

Screen 12

Show the video: River erosion, transportation & deposition (just over 2 mins). Ask learners to discuss the questions posed.

Focus questions

- How do rivers erode land?
- What are the types of transportation?
- How do erosion, transportation and deposition shape the land?

Screen 13

Explain to learners that the Padma river is in Bangladesh. It is the main distributary of the Ganges, flowing generally southeast for 356 kilometres (221 miles) to where it meets with the Meghna river near the Bay of Bengal. Ask learners to look at the map and discuss the questions posed.

Focus questions

- Where is the Padma on the map?
- Where does the Padma flow to?
- What do you notice about the shape of the Padma? Why do you think it is this shape?
- Since 1966, over 66,000 hectares of land has been lost to erosion of the Padma. Why do you think this has happened?

Screen 14

Ask learners to imagine they live in a village at the side of the Padma river. Villagers farm the land by the river and fish in the Padma. Then, to watch the videos before discussing the questions posed. The second video is over 6 minutes long. If time is short just show the beginning of the video, with the buildings being destroyed.

The Padma River (just over 2 minutes)

The Breakdown of the Terrible Padma River in Shariatpur, Bangladesh (just over 6 minutes)

Focus questions

- What do you think the villagers should do? Why? How could you encourage them?
- What could they do about food? How could this help?
- What environmental damage is being done by the erosion? Why do you think this?

TASK 3

WHY DO WE GATHER INFORMATION ABOUT RIVERS?

Explain to learners that they will find out about the importance of monitoring rivers before going out to measure and calculate the river discharge (rate of flow – cubic metres per second) of a local river.

Screen 3

Ask learners to discuss the questions posed.

Focus questions

- Why do you think we collect data and information about rivers?
- What types of data and information do you think are collected? Why?
- Who might collect this data? Why?
- What do you think they do with this data? How do you know?

Screen 4

This screen gives some reasons as to why it is important to collect data and information about rivers. Ask learners to consider the reasons and discuss the question posed.

Focus questions

- How is each of the reasons important to your everyday life?
- Why do you think collecting these data is important to monitor climate change?

Screen 5

Explain to learners that many types of data are collected about rivers. Examples include:

- **Width:** The width of the river is measured from one bank to the other where the water surface meets the dry land.
- **Depth:** Depth measurements are taken at regular intervals across the river width.
- **Velocity:** River velocity (flow speed) is recorded at different positions across the channel.
- **Discharge:** River discharge represents the total volume of water flowing through the river per unit of time.
- **Observations:** These include noting changes in riverbed features, vegetation, sediment types, and any signs of pollution or erosion.
- **Pollutant levels:** Water samples are collected to measure pollutant levels such as phosphates and nitrates. These pollutants can impact water quality and aquatic life.

Screen 6

Ask learners to consider why measuring river discharge is important by looking at the given ideas and to say whose idea they think is the most important and why. Then, to say whether they disagree with anyone's idea and why.

Screen 7

Explain to learners that river discharge was originally recorded to predict floods and droughts. It later became an essential part of designing hydroelectric dams. Presently, discharge monitoring helps in detecting climate change and environmental changes.

Inform learners that they are going to measure river discharge of a local river.

Remind them that river discharge represents the total volume of water flowing through the river per unit of time. It is calculated by multiplying the cross-sectional area (width x mean depth) by the velocity. Ask learners to discuss the questions posed.

Focus questions

- What measurements do you think you will need to take? Why?
- What equipment do you think you will need to take these measurements?

Screen 8

This screen gives instructions for taking the measurements of the river, accessed from the buttons – width, depth and velocity.

Screen 9

Having read the instructions on the previous screen, invite learners to discuss the questions posed.

- What do we need to measure?
- What equipment do we need? Why?
- How will we carry out measurements? Why like this?

Then, to think about how they will find the location of the site where they take measurements, using GPS and/or GIS.

Screen 10

This screen gives a table they can complete with their measurements.

Screen 11

Take learners outside so they can take the measurements needed to calculate river discharge.

Screen 12

Ask learners to do their calculations for measuring river discharge.

- Calculate the mean depth.
- Calculate the mean time for your float to travel 5m.
- River velocity is calculated as distance divided by time – we know the distance is 5m.
- Calculate velocity by 5 (m)/mean time (s).
- Calculate the river discharge by velocity (m/s) x depth (m) x width (m).

Ask learners to discuss the questions posed.

Focus questions

- What units should we use for river discharge? Why?

You can check whether calculated river discharge measurements are within the range expected by looking at Search Data - National River Flow Archive and ask learners to check their calculations if any seem awry.

Screen 13

Explain to learners that the National River Flow Archive (NRFA) is the UK's official record of river flow data. They collate, curate and provide access to data from over 1,600 gauging stations all around the UK, including those operated by Natural Resources Wales. The data is used, for example, to assess water availability and the impacts of climate change over time. Some of their records go back to the nineteenth century and many go back to the 1960s, allowing them to identify long-term trends in river flows and to assess flood and drought events in relation to other similar events in the past.

Invite learners to access the link and search for the nearest gauging station to where they live. The easiest way to do this is to run the cursor over the orange dots (gauging stations) near their home and note the number, then type it into the search box. The station's datalink will appear below. Click on the number in the datalink to be taken to the data for that station. National River Flow Archive – Search Data

Then, to discuss the questions posed.

Focus questions

- What river flow information can you find? What does it tell you? How do you know?
- What does the peak flow data tell us? Why do you think that?

TASK 4

HOW HAS THE RIVER WYE'S USES CHANGED OVER TIME?

Explain to learners that they will study one river in more detail (for screen 3 to function properly it might be wise not to tell them this is the Wye) and look at how it was used historically compared with today. Then, to produce a digital poster to show their findings.

Screen 3

Invite learners to study the photograph and discuss the questions posed.

Focus questions

- What is this a photograph of? How do you know?
- Where is the photograph taken from? Why do you think this?
- In which direction is the river flowing? How do you know?

Screen 4

Ask learners to discuss the questions posed.

Focus questions

- What do you know about the River Wye? How do you know these things?
- Where is the river? Where is the source of the river? Where does it flow into the sea? Why do you think that?

Then, to complete the sentences given.

Screen 5

Explain to learners that the Wye is one of the longest rivers in Wales, running for some 250 kilometres (155 miles) through the counties of Powys, Herefordshire and Gloucestershire. For much of its length the Wye forms part of the border between Wales and England and is joined by the Elan and Lugg rivers, as it meanders past the ruins of Tintern Abbey, before entering its tidal estuary.

Ask them to look at the OS map and find the coordinates highlighted then follow the path of the river.

- The Wye rises on the eastern slopes of the uplands of Plynlimon in central Wales 52.2851°N 3.4556°W. It flows south-east to Rhayader, Builth Wells, Hay-on-Wye and Ross-on-Wye, before meeting the Severn estuary just below Chepstow 51.3636°N 2.3942°W.

Screen 6

Explain to learners that the River Wye provided sea access for:

- Chepstow Castle: first built in 1067
- Goodrich Castle: Built after the Norman Conquest of England, strengthened and expanded in 12th and 13th Centuries.

Ask learners to find these castles on the OS map, and discuss the questions posed.

Focus questions

- Why do you think these castles were built in these positions?
- What are the advantages of the castles being near the river? Why do you think that?
- What are the disadvantages? Why?

Invite learners to search for information about how the river was important to these castles.

Screen 7

Inform learners that they are going to carry out research to find out how the River Wye was used in the past. This research will be used to make a digital poster to compare how it was used in the past and how it is used now.

Ask learners to decide how they will carry out an internet search. Remind them to consider:

Before researching...

- 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?

You will need to use images in your poster.

- How could you check whether the images are free to use? Would they have a copyright? What makes you think that?

Screen 8

This screen has a QuADS grid to help learners to plan and carry out their search. Ask them to store their findings digitally.

Screen 9

Explain to learners that they now need to look at how the River Wye is used today. Ask them to discuss the questions posed.

Focus questions

- How do you think the River Wye is used today? Why do you think this? How do you know?
- What types of industries are on the river? What do you know about these industries?
- How is the river used by locals? How do you know?
- How is the river used by tourists? How do you know?

Screen 10

Invite learners to carry out internet searches to find out whether their ideas were correct and to add any new information they find, again using a QuADS grid as before. Ask learners to store their findings digitally.

You could visit the River Wye to check their internet findings and to take their own photographs to use.

Screen 11

To help them make a good poster, ask learners to discuss the questions posed.

Focus questions

- What makes a good poster? Why do you think that?
- What words are important to include? Why?
- What images are important to include? Why?
- What are the key messages you want the poster to convey? Why?
- How will you make use of colour in your poster? Why?

Then, to create their digital poster.

Screen 12

Invite learners to share their digital poster with others in the class, asking them to feedback on:

- How well does the poster compare how the River Wye was used in the past and now?
- How well does the poster use:
  - images
  - colour
  - text?

Then, to make amendments to their poster to improve it.