WHAT CAN WE SEE IN THE DARK IN CLWYDIAN RANGE AND DEE VALLEY?

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 more about the stars and planets in our solar system and make a scaled model of the solar system outside. They find out about different star constellations and the stories behind them. Learners explore light pollution in Clwydian Range and Dee Valley National Landscape and its Dark Skies Discovery Sites, before going outside in the dark to view planets and constellations of stars. They explore maps and photographs to consider the causes of light pollution and where it is most prevalent. Learners look at lighting in the area they live and develop design ideas for improving the lighting to reduce light pollution.

CURRICULUM FOR WALES

Areas explored:

- 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.
Access to Find out what every symbol means on an OS Explorer map - OS GetOutside.
Means of measuring, e.g. ruler, metre rule, sports measuring tape, pedometer.
Print out of constellation – Task 2 screen 13.
Possibly Star Gazing Guide leaflet – downloaded or printed.
Possibly downloaded free apps such as:

- Star Chart app on Android or iPad
- Night Sky app on Android or IOS
- SkyView Lite on Android or IOS
- GoSkyWatch Planetarium on iPad.

Means of taking photographs (e.g. smart phone, tablet, camera).

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

WHAT DO WE KNOW ABOUT STARS AND PLANETS?

Explain to learners that this task should help them to find out more about the stars and planets in our solar system. Then, they should be able to make a scaled model of the solar system.

Screen 3

Invite learners to consider the questions posed.

Focus questions

- What are stars?
- Which is the closest star to Earth? Why do you think this?
- What are planets?
- Which planets do you know?
- What do you know about each planet?

Then note their answers in the table on the next screen.

Screen 4

Ask learners to try to complete the table with their ideas and use the key below to rate each answer as to how confident they are that they are correct.

1 = confident

2 = slightly confident

3 = not at all confident or don't know

Screen 5

Tell learners that they are going to use the internet to check their answers on the previous screen.

Ask them to think about the points about internet searches.

Before researching think about...

- What search terms could you use? Which are the best? Why?
- What type of sites will be the best to use, why?

When assessing information/data think about...

- 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?

Screen 6

This screen shows learners' completed tables so that they can review their answers. Ask learners to check the answers they rated 2 and 3 and to update the table with their findings.

Screen 7

Learners have been working in pairs up to this point. However, putting them into small groups for the rest of the task will be more manageable. Invite learners to do more online research to find out the answers to these questions:

Focus questions

- What planets are in our solar system?
- What order are the planets in from the Sun outwards?
- How far is each planet away from the Sun? Why does this change?
- What is the diameter of each planet?
- What is the diameter of the Sun?

A table is provided on the next screen so they can type in their answers.

Screen 8

This screen gives the table to complete from the previous screen.

Screen 9

Ask each group to think about how they could represent our solar system to scale. Then, to make a scaled model of our solar system they can show others outside.

The mathematics involved in scaling the model requires the use of large numbers which are better represented in standard form. Some of your learners might well be able to manipulate such numbers. However, others might struggle. To support the mathematics, you could ask learners to access Student Project: Make a Scale Solar System - NASA/JPL Edu which gives detailed guidance on how to build a scaled solar system model from thinking about what type of model to make to where the model will be shown to the calculations required.

Screen 10

Invite learner to build their solar system model outside.

TASK 2

WHICH STARS AND PLANETS CAN WE SEE IN THE NIGHT SKY?

Explain to learners that in this task they will learn about star constellations and the stories behind them. They will find out about light pollution in Clwydian Range and Dee Valley National Landscape and its Dark Skies Discovery Sites, before going outside in the dark to view planets and constellations of stars.

Screen 3

This screen gives information about stars. Ask learners to discuss the questions posed.

Focus questions

- Why can you see stars in the night sky?
- Why can't you see many stars in the daytime?
- Why can you see some planets in the night sky?
- Why can you see different stars at different times in the night sky?

Screen 4

This screen gives information about light pollution in Clwydian Range and Dee Valley. Ask learners to discuss the question posed.

Focus question

- Where do you think the main sources of light pollution are in Clwydian Range and Dee Valley?

Then, ask them to use the map to find these places and type their ideas in the box provided.

Screen 5

An image showing the four Dark Sky Discovery Sites in Clwydian Range and Dee Valley is given here. Ask learners to use the image to try and work out where each site is in Clwydian Range and Dee Valley. Then, to record their answers in the box provided.

Focus question

- What are the names of each of these sites?

Screen 6

Learners' ideas as to where each site is in Clwydian Range and Dee Valley from the previous screen are shown here. Invite learners to use the map to check their ideas and amend them as necessary.

Screen 7

Learners' ideas as to the Dark Sky Discovery Sites in Clwydian Range and Dee Valley are given again here, with the answers so that learners can check how many they had correct.

1. Horseshoe Falls, Llangollen, LL20 8BN
2. Car Park, Bwlch Pen Barras, Mold CH7 5SH
3. Arthur Car Park, Offa's Dyke Path, Mold CH7 5NZ
4. Llangwyfan Car Park, Nannerch, Denbigh CH7 5RP.

Screen 8

An image of the Milky Way from Clwydian Range and Dee Valley is shown on this screen. Ask learners to discuss the questions posed.

Focus questions

- What is the Milky Way?
- When have you seen the Milky Way? Where were you?
- Why do you think the Milky Way is so clear in the photograph?

N.B. *The Milky Way is the galaxy that includes the Solar System, with the name describing the galaxy's appearance from Earth: a hazy band of light seen in the night sky formed from stars that cannot be individually distinguished by the naked eye.*

Screen 9

This screen gives information about how the star constellations were named, with an image of Perseus and Andromeda.

Screen 10

A Welsh perspective is taken here, with how Perseus and Andromeda are named Lleu Llaw Gyffes and Blodeuwedd in Welsh mythology and a revised image.

Screen 11

Explain to learners that sometimes it is difficult to see why star constellations were turned into such complex images. For example, the Pegasus (flying horse) star constellation looks like this. Ask learners to think about:

- Where are the wings?
- Where are Pegasus' rear legs and tail?

Screen 12

A wider perspective is given on this screen, from the Ojibwe, indigenous people of North America, who use their constellations to give life lessons.

Screen 13

Ask learners to think about how they might use the star constellation diagram (of Scorpio) to draw some type of mythical person or beast by linking the stars. You can print off the image so that learners can draw on the constellation. Invite learners to invent a story about their mythical person or beast and to tell it to others in the class.

Screen 14

Inform learners that they are going to go outside to see which star constellations they can identify.

There are many ways they can use to identify the constellations, e.g. an app, a leaflet or a printed sky map. The image on the screen can be printed – this gives the constellations in the northern hemisphere. You may wish to download the Star Gazing Guide leaflet or download a free app such as:

- Star Chart app on Android or iPad
- Night Sky app on Android or IOS
- SkyView Lite on Android or IOS
- GoSkyWatch Planetarium on iPad.

Screen 15

As learners to complete the quiz before they go outside, so they can get the best experience of viewing the night sky.

Screen 16

Introduce learners to the webpage Night Sky Map & Planets Visible Tonight. From here you can identify planets in the night sky at different times of the year. Ask them to type in their location. The webpage will tell them the planets they can see tonight.

Focus questions
Using the website ask them to discuss:

- Which planets could you see tonight?
- Which planet(s) could you see at midnight?
- Why can you see different planets at different times in one night?
- Why can you see different planets at different times of the year?

Screen 17

Invite learners to go outside to identify some star constellations and planets.

TASK 3

WHAT CAN WE DO TO HELP KEEP US IN THE DARK?

Explain to learners that this task will help them to explore how to reduce light pollution.

Screen 3

Ask learners to access the on screen map on this link: Dark Skies and Light Pollution in Wales – Wales Dark Skies and also, to use the OS map of the Clwydian Range and Dee Valley.

Invite them to consider the maps and discuss the questions posed.

Focus questions

- What is the dark sky map telling you? How do you know?
- Where is the most light pollution in the Clwydian Range and Dee Valley? Why do you think that?
- What is likely to be causing this light pollution? How do you know that?
- Where on the map is the greatest light pollution? How can you tell? What might be causing this? Why do you think that?

Screen 4

Inform learners that Clwydian Range and Dee Valley National Landscape has created Prosiect Nos – The North Wales Dark Sky Partnership which also includes the Eryri National Park Authority and the National Landscapes of the Isle of Anglesey and the Llŷn Peninsula.

Invite them to watch this video of the Clwydian Range and Dee Valley National Landscape Dark Skies - Clwydian Range and Dee Valley and to discuss the questions posed.

Focus questions

- What message is the video sending? Why do you think that?
- Why do you think there are no words on the video?
- Why do the stars seem to move?

Screen 5

Explain to learners that Clwydian Range and Dee Valley National Landscape is spearheading an all-Wales Dark Skies project involving all eight designated landscapes, which have individually been implementing local strategies to improve their dark skies.

The initiative seeks to decrease light pollution, with the hope of benefitting biodiversity, the climate and public health.

Screen 6

Invite learners to look at the photograph of Swansea at night and discuss the questions posed.

Focus questions

- What do you think are the light sources you can see? Why do you think that? List your ideas.
- What are the brightest lights? How do you know?
- What do you think this would look like as an aerial photograph? Why do you think that? Would these lights be visible from an aeroplane in the sky? How do you know?

Screen 7

Explain to learners that light pollution is a global issue that has increased by up to 400% in the last 25 years and is obscuring all but a few of the sky's brightest stars.

The screen asks the question 'Why is there so much light at night?' and provides a talking head that suggest that 'Humans are naturally afraid of the dark!' Invite learners to consider the response and to discuss the questions posed.

Focus questions

- How much do you agree with this statement? Why?
- What fears do you have about the dark? Where do you think these come from? Why?
- Do these fears make sense? Why do you think that?
- What can we do to overcome these fears? Why do these things help?

Screen 8

Explain to learners that our fear of the dark is an evolutionary trait that we picked up to survive real-life predators stalking at night. Invite them to consider the information provided and to discuss the questions posed.

Focus questions

- How do you think the woman in the image feels? Why?
- How do you think she would feel if this were in the daytime? Why?

Screens 9-11

Explain to learners that they are going to devise activities for a partner to try outside when blindfolded. Invite them to devise three activities for their partner to try.

Take learners outside, ask them to blindfold their partner and try out the activities. Learners should swap roles and when they have completed the activities, discuss the questions posed.

Focus questions

- How did it feel to be blindfolded? Why do you think it felt like that?
- Which activity was the most difficult? Why?
- Which activity was the easiest? Why?
- What problems did you have with the other activities? Why do you think you had these problems? How were you able to tackle these problems?

Screen 12

Explain to learners that essentially, being afraid of the dark is a fear of the unknown. We can't see what's out there and often our imagination thinks the worst possible things.

To conquer our fears, we may leave night lights on or lights outside our homes. Changes in technology mean we have more lights, phone and tablet screens and TV sets that make darkness a choice, rather than inevitable.

However, by creating safety in our light, we have lost our connection to the night sky. Star counts by public awareness campaign Globe at Night revealed that, between 2011 and 2022, the world's night sky more than doubled in artificial brightness.

Screen 13

Inform learners that high streets, advertising and historical buildings and monuments all contribute to light pollution. Invite them to look at the images on the screen and to discuss the questions posed.

Focus questions

- What is causing the light pollution in these photographs?
- Why is there so much light? Why do you think that?
- What is the purpose of these lights? How do you know?
- What might be done to reduce the pollution these are causing?

Screen 14

Invite learners to consider what makes a good outside light and to discuss the questions posed.

Focus questions

- Why do you think these lights are needed? What makes you think that?
- How do you think these lights would affect light pollution? Why do you think that?
- How do you think the design of these lights could be improved to reduce their contribution to light pollution? Why would that make a difference?

Screen 15

Invite learners to carry out research to find out about how outside lights are being changed to try and reduce light pollution. When assessing information/data ask them to think about the questions posed.

Focus questions

When assessing information/data think about...

- 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?

Screen 16

Inform learners that as part of the National Dark Skies project, a specialist lighting design company will deliver projects in all eight areas to identify how to reduce light pollution.

Explain to learners that they are going outside to look for lights that people have on the outside of their homes and in their gardens and to identify things that reduce light pollution. Ask them to discuss the questions posed.

Focus questions

- How will you identify lights that are likely to add to the light pollution in your area? What will you look for? Why?
- How will you know the difference between lights that do and don't add to light pollution? What will you look for? Why?

Screen 17

Take learners outside, ask them to take photographs of lights they see on homes, in gardens, on shops, and other buildings as well as different types of street lighting.

Screen 18

Ask groups of learners to select a few photographs that show lights that are **more likely** to make a significant contribution to light pollution in the area.

Invite them to choose one photograph for each pair in the group and for each pair to look at the photograph and consider how they could improve the design of the light to reduce its contribution to light pollution.

Invite learners to use their research and knowledge of science as evidence to support their design ideas and to sketch a new or better design for a lamp that would have much less of an impact on light pollution.

Screen 19

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 prior work, 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.