EXPLORING COPPER IN ERYRI

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 explore how humans have extracted metals and developed new metals over time. They are introduced to historical artefacts that have been found in Wales and consider whether these artefacts should be brought back to Wales to be put on show. Learners explore copper in terms of its properties and uses, before designing and making a wind spinner. They consider how copper conducts electricity, before making a greeting card that lights up.

CURRICULUM FOR WALES

Areas explored:

- Expressive Arts
- 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.
Means of making a spiral wind spinner, e.g. pliers, copper wire, string, etc.
Means of cutting/shaping natural materials for the spiral wind spinner, e.g. scissors.
Means of making a greeting card that lights up, e.g. an LED (bulb), copper tape (you could use copper anti-slug tape from a garden centre), card, a battery and sticky tape.

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

THE BRONZE AGE METALS

Explain to learners that they will look at how humans made artefacts from metals over time.

Screen 3

In groups, ask learners to interrogate the image.

Screen 4

Explain to learners that evidence shows us that copper was mined in the Great Orme Mines, Llandudno, in the Bronze Age c. 2500-2000 BCE until c. 800 BCE. Ask them to discuss the questions posed.

Screen 5

This screen gives information about using copper to make bronze from around 2150 BCE.

Screen 6

Show the video: Life in the Bronze Age - The Story of Britain - BBC Teach (about 6 minutes). Then, ask learners to discuss the questions posed.

Focus questions

- Why was the Bronze Age so important?
- Why did bronze have such a major impact on life at the time?
- What differences did it make to people's everyday lives?
- Why did people dig so far into the ground to find copper, as at Great Orme, near Llandudno?

Screen 7

Explain to learners that many other kinds of minerals are hidden in the mountains of Eryri, including lead, zinc, iron, gold and manganese - all mined at one time or another.

Also, that over time, there have been many archaeological finds of artefacts from the past in Wales. The next few screens give some examples.

Screen 8

This screen gives information about a gold artefact, Llanllyfni lunula, found near Llanllyfni which dates to the beginning of the Bronze Age, 2400-2000 BCE.

Screen 9

This screen gives information about the Mold gold cape (*Clogyn Aur yr Wyddgrug*), a ceremonial cape of solid sheet gold from Wales dating from about 1900-1600 BCE in the Bronze Age.

Focus questions

- What do you know about the Great Orme copper mine? How do you know this?
- What did people use as tools to mine copper? How do we know?
- What are the rock structures in the photograph? Why do they form?
- How can you tell this is a copper mine?
- Where else in north Wales are there old copper mines? How do you know?

Screen 10

This screen gives information about the Rhos Rydd Bronze Age shield, which dates from 1300 to 1000 BCE and was found in a bog at Blaenplwyf near Aberystwyth.

Screen 11

This screen gives information about the Trawsfynydd Tankard dating to the late Iron Age, 50 BCE to 75 CE.

At this point, you could ask learners to draw a timeline of these finds, to see whether they understand BCE and CE.

Hopefully, learners have realised that none of these artefacts are housed in Wales.

Screen 12

Explain to learners that over the years there have been many calls for Welsh historical artefacts to be repatriated to Wales rather than being housed in museums in England. Ask them to discuss the questions posed.

Focus questions

- What do you think about these artefacts being housed in England?
- If the artefacts were brought back to Wales, where should they be housed? Why?
- Once in Wales, what measures might be needed to keep the artefacts safe? How could we do this?

Screen 13

Inform learners that they are going to find out about historical artefacts found in Wales, what they are, their significance and where they are currently housed.

Once they have all the information, they will write a post for the school social media to encourage people to think about repatriating historical artefacts to Wales.

Encourage learners to use the QuADS grid on the next screen to help structure their research.

Screen 14

This gives a QuADS grid for learners to complete.

Screen 15

Ask learners to discuss the questions posed.

Focus questions

- What are the key pieces of information? Why do you think that?
- What could you leave out? Why?
- How will you ensure you do not directly copy text? Why is this important?
- How will you present this information in your post? Why?
- How will you interest and engage the reader?
- Where will you look for good quality images to include? Why?
- Would these images be free? How do you know? Would they have a copyright? What makes you think that?

Screen 16

Invite learners to write and publish their social media post and monitor reactions to it.

TASK 2

HOW DO WE USE COPPER?

Explain to learners that in this task they will explore copper in terms of its properties and uses before designing and making a wind spinner.

Screen 3

Ask learners to discuss the questions posed.

Focus questions

- What items do you know that are made from copper?
- What are these items used for?
- Why do you think these items are made from copper instead of another material?

Screen 4

Copper is described on screen. Ask learners to discuss the question posed and add their ideas to the table.

Focus question

- What do the terms malleable, ductile, thermal conductivity and electrical conductivity mean?

Screen 5

Invite learners to research their ideas in the table to find the actual meaning of the terms and complete the table.

Screen 6

The properties of copper are given again on screen. Thinking of the properties of copper, ask learners to discuss the questions posed.

Focus questions

- What everyday items use one of the properties of copper:
  - malleable
  - ductile
  - thermal conductivity
  - electrical conductivity?
- What everyday items make use of more than one property of copper? List as many items as you can.

Notes on copper: *Copper is used as a conductor of heat and electricity, as a building material, and as a constituent of various metal alloys, such as sterling silver used in jewellery, cupronickel used to make marine hardware and coins, and constantan used in strain gauges and thermocouples for temperature measurement.*

Copper is one of the few metals that can occur in nature in a directly usable metallic form (native metals). This led to very early human use in several regions, from c. 8000 BCE.

Commonly encountered compounds are copper (II) salts, which often impart blue or green colours to such minerals as azurite, malachite, and turquoise, and have been used widely and historically as pigments.

Copper used in buildings, usually for roofing, oxidises to form a green patina of compounds called verdigris. Copper is sometimes used in decorative art, both in its elemental metal form and in compounds as pigments. Copper compounds are used as bacteriostatic agents, fungicides, and wood preservatives.

Screen 7

Inform learners that they are going to make a spiral wind spinner from copper wire and natural materials. Show the video: Wind Spiral with Marble, Sea Green (less than 30 seconds). Ask learners to discuss the questions posed.

Focus questions

- What optical illusion does the wind spinner in the video cause?
- Where have you seen optical illusions before? What were they?
- What do you think causes an optical illusion? Why?

An article on optical illusions: Optical Illusion: Definition, Types, Explanation, Working And Pictures.

Screen 8

Tell learners that they will go outside to decide where to put the wind spinner and find other materials they could use. Ask them to discuss the questions posed.

Focus questions

- Where could you put your wind spinner?
- Will these places get enough wind? Why?
- Might these places get too much wind? Why?
- What problems could your wind spinner cause for other organisms? How can you minimise any problems?
- If you were growing your own vegetables or fruit, how could you use wind spinners to protect your crops?
- How big should your wind spinner be? Why?
- What natural materials are available for you to use to make your wind spinner? Which are the best to use? Why?

Screen 9

Take learners outside to decide on the position, size and any natural materials they could use.

Screen 10

Invite learners to research online to find images of spiral wind spinners and store the images digitally.

Screen 11

As the wind spinners will be made from copper wire, ask learners to consider copper's properties and discuss the questions posed.

Focus questions

- How will these properties of copper enable you to make a wind spinner?
- Which of your stored images would be simple to reproduce using copper wire? Why?
- How could you use natural materials in your design? What materials would you use?
- Select your favoured design. Would you want to change any elements of the design? Why? How will you change these elements?
- How big will your wind spinner be? Why?

Then, ask learners to draw the design of their wind spinner, including any measurements.

Screen 12

Tell learners that they will be given: pliers, copper wire, string. Ask them to discuss the questions posed.

Focus questions

- What other equipment will you need to make your wind spinner? Why?
- What natural materials will you use? Why?
- How will you use these natural materials?

Screen 13

Ask learners to make their wind spinner and hang it outside. Then, discuss the questions posed.

Focus questions

- How well does your wind spinner spin in the wind?
- What optical illusion(s) does your wind spinner cause?

Invite learners to make any amendments needed to improve their wind spinner.

Screen 14

Invite learners to start at the base of the triangle and think about how they made their wind spinner: 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.

TASK 3

HOW CAN WE USE COPPER'S ELECTRICAL PROPERTIES?

Explain to learners that they will consider how copper conducts electricity before making a greeting card that lights up.

Screen 3

Explain to learners that metals conduct electricity because they have 'free electrons'. These are electrons that are not bound to an atom.

Show the video: What is electricity? - STEM kids (about two and a half minutes). Then, ask learners to discuss the questions posed.

Focus questions

- What is an atom?
- What is an electric current?
- What does 'conductor of electricity' mean?
- Why do metals conduct electricity?
- What does 'insulator' mean?
- Why are electrical wires surrounded by a plastic case?
- What is needed to make electricity flow?

N.B. *For further background information: Conductors and insulators - KS3 Physics - BBC Bitesize.*

Screen 4

Inform learners that they are going to make a greeting card that lights up, using an electrical circuit.

Show the two videos as to how to do this:

60 Seconds DIY Paper Circuit Tutorial (about 1 minute)

Cupcake Paper Circuit Card with LED Light (about 6 minutes).

Screen 5

Inform learners that they will have: an LED (bulb), copper tape, card, a battery and sticky tape. Ask them to think back to the two videos and write or draw the plan they are going to follow.

Screen 6

Ask learners to draw their electric circuit, showing the positive and negative sides of the battery and LED and how the switch will work. Then, to discuss the questions posed.

Focus questions

- Why do you think batteries and LEDs have a positive and negative side?
- How does the switch work?

N.B. *If learners need support to use electrical component symbols, you could show: How do you draw electrical symbols and diagrams? - BBC Bitesize (about 1 and a half minutes).*

Screen 7

Invite learners to make their greeting card that lights up.

Screen 8

Ask learners to show their card to others and give feedback on:

- Two things they thought were good and why.
- One thing that could be better and why.