Reuse and Recycling of Waste Electrical and Electronic Equipment

Teacher Topic Pack

P4 - P7

Greener Orkney | XS Resources | employ ability orkney | restart Orkney employment • reuse • recycling

https://www.xsresources.org/orkney-electricals-collections

Proud supporter

recycle your electricals campaign

Topic: Reuse and Recycling of Waste Electrical and Electronic Equipment

Topic Overview: Reuse of electrical and electronic equipment to extend product lifespan and protect scarce resources.

Activity Overview: Pupils dismantle a mobile phone to identify the different components and materials used within technology.

Resources:

All resources contained within WEEE reuse pack. Request pack from your Waste and Recycling Officer at Orkney Islands Council.

Discussion

- **Poster 1: Components of a mobile phone**
- **Poster 2: Elements of a mobile phone**
- **Worksheet 1: Drawing a mobile phone**

Main Activity:

- **Old phones for dismantling**
- **Tool kits (available from OIC Recycling Team)**
- **Worksheet identifying key components**

Core Experiences & Outcomes

TCH 2-02a – Having analysed how lifestyle can impact on the environment and Earth's resources, I can make suggestions about how to live in a more sustainable way.

Learning Intention: I will understand why reuse is more environmentally friendly than recycling.

Success Criteria: I can explain why reuse is preferable to recycling, referring to the valuable materials used in electrical and electronic equipment.

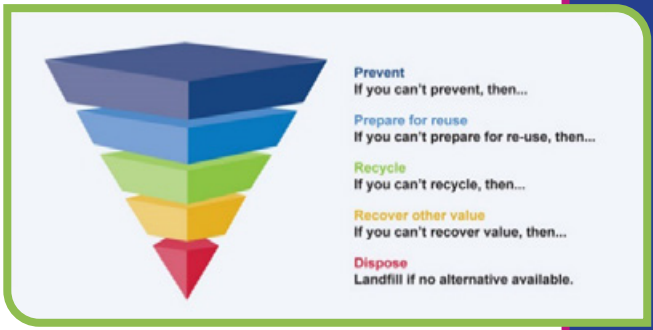
Science Skills • OBSERVING • EXPERIMENTING • RECORDING

Key Vocabulary:

WEEE – Waste Electrical and Electronic Equipment. Electrical and Electronic items are defined as items with a plug or battery.

Waste Hierarchy Diagram illustrates the Scottish Government definition.

For children it is usually shortened to the 3 R's (Reduce, Reuse, Recycle).



Reduce – lowering how much energy and/or materials are used e.g. purchasing items with no/less packaging.

Reuse – using items again (and again) for example by donating or purchasing items from a charity shop.

Recycle – convert waste into reusable material

Circular Economy: A move from the conventional "make goods – use goods – dispose of goods" approach. The circular economy is an alternative system in which products and materials are kept in a high-value state of use for as long as possible. For example designing a phone to be easily repaired, rather than replaced.

Critical Raw Materials – Critical raw materials (CRMs) are not necessarily materials that are scarce. A material is defined as a CRM if it meets the following three criteria:

- Economically important for key sectors in the European economy, such as consumer electronics, automotive, aerospace, etc.
- A fragile supply chain e.g. the material is typically imported from particular countries.
- There is a lack of (viable) substitutes, due to the very unique and reliable properties of these materials.

Topic Plan

This topic has been broken down into 30 minute – 1 hour sessions to enable teachers to either work through the topic over the course of a term, or to pick and choose sessions based on the interests of pupils. Workshops and a resource pack to support learning can be arranged through the Orkney Islands Council Recycling Team.

Teacher Links:

Video clip about electronics recycling produced by Recycle Your Electricals (suitable for children). How are electronics recycled? Ask Hypnocat:

https://www.youtube.com/watch?v=7msucy0Jl1c&t=1s

Video clip describing Circular Economy produced by Ellen MacArthur Foundation (suitable for children):

https://www.youtube.com/watch?v=zCRKvDyyHml

Video clip from Fairphone entitled: Fairphone research trip: Visiting tin, tantalum and tungsten mines Note: This clip is recommended for pupils aged 10 plus due to vocabulary used.

https://vimeo.com/107812653

Establishing Prior Knowledge (10 mins):

Discussion Points

- Discussion of waste hierarchy (Reduce, Reuse, Recycle).
- What is electrical/electronic equipment? (Anything with a plug or batteries)

Concept Introduction (20 mins):

"Hands-up" survey on Ownership of Electrical/Electronic Items

- How many mobile phones are there in your home?
- Count up how many phones are present within homes within the class.

Pupils could suggest additional electrical items that they own. Pupils to get an appreciation of how many electrical items have been manufactured in the world.

Introductory Activity (1hr):

What's inside a tablet/ mobile

This activity could be done in conjunction with the main activity (taking apart a mobile phone).

Poster 1 and **Poster 2** detail the different materials that make up a tablet/ mobile phone. Approximately 40 different elements are used within each phone/ tablet.

Pupils to use **Worksheet 1:** (Outline of mobile phone) to draw the different components of a tablet/ mobile.

If your school has requested the resource box, it will contain a set of screwdrivers and mobile phones.

Fun Facts to support discussion:

New research funded by Recycle Your Electricals in 2020 revealed that:

- UK households and businesses are producing 1.45 million tonnes of electrical waste per annum
- 1.65 million tonnes of electricals are bought each year
- 915,000 tonnes of electricals are sent for reuse and recycling
- At least 500,000 tonnes of waste electricals are being lost through being thrown away, hoarded, stolen, or illegally exported
- Electrical waste is one of the fastest growing waste streams in the UK and in the world, with discarded or hoarded household electricals estimated to cost the UK economy over £370 million per year of lost valuable raw materials such as gold, copper, aluminium and steel.

Source: Recycle Your Electricals

Main Activity: Components of Phones/technology

Health and Safety

1. **Prior to providing the pupils with a phone to take apart remove the battery intact. Batteries contain hazardous materials and should be recycled appropriately.**
2. **Many components or tools will contain sharp edges, which could present a potential risk, care should be taken at the outset to ensure that pupils take responsibility for their actions.**
3. **Ensure that all tools are counted back in at the end of the session.**

Activity (approximately 45 minutes – 1hr)

1. To support activity, see and download materials from: **https://www.xsresources.org/education-work**
2. Provide pupils with phones that have had the battery removed and a selection of tools.
3. Remove the small screws located on the back cover (some screws may be covered by stickers) if necessary.
4. Separate the battery compartment to expose the circuit board.
5. Remove the small screws securing the circuit board.
6. The vast majority of components are on the circuit board, but there will be others on the casing, etc that can also be removed, e.g. the screen, speaker, etc.
7. There are approximately 300 components within each phone, ask the pupils to count up and identify individual components and their uses.
8. Ask the pupils to photograph the activity or draw the individual components.
9. Allow some time at the end for the phones to be re-assembled.

Follow-on Activity: Components of Electrical/Electronic Equipment

Discuss that some metals are very important, but that there can be issues with their supply. These are called critical raw materials. These elements are often used in electronic equipment and without them, it would be difficult to manufacture electronic/ electrical goods.

Pupils to suggest electrical/ electronic equipment that they use and how they would feel/ what they would do if they could not use it. E.g. Mobile phones used to call/ text friends and family. Pupils may feel more isolated because they cannot speak to people they care about.

Research "critical raw materials" and watch the Video clip from Fairphone entitled: Fairphone research trip: Visiting tin, tantalum and tungsten mines.

Note: This clip is recommended for pupils aged 10 plus due to vocabulary used.

https://vimeo.com/107812653

Fun Facts:

- Mobile phones contain over 40 different chemical elements and hundreds of components. Pupils to think about the number of kilometres/ miles travelled by the elements within a phone.
- Mobile phones contain gold, platinum, tin, lead, silver, copper, silver, aluminium and a range of other elements. These elements have to be mined and some are very rare.

Discussion points

1. Pupils to consider how they would feel working in the mines.
2. Pupils to consider ways that reduce their use of scarce resources e.g.
    - Not upgrading their phone as frequently
    - Buying second hand equipment
    - Repairing equipment
    - Taking care of items to ensure that they last longer
    - Passing on/ selling unwanted items for other people to use.
    - Raising awareness
    - Buying sustainably manufactured equipment (if possible).

Conclusions:

- What happens to electronic/ electrical equipment owned by the pupils/ families when it is no longer needed? – Suggested responses may include: Passed on to friends/ family, hoarded, recycled, landfilled/ binned, sold, donated to charity shops.
- Discuss the merits/ disadvantages of what happens to equipment when it is no longer needed.
- Briefly introduce the waste hierarchy (reduce, reuse, recycle).

Extension ideas:

- Pupils design posters/ leaflets to raise awareness of the importance of reusing equipment.
- Pupils research the different elements that are found within a phone.
- Pupils to complete the wordsearch

Home Links:

- Pupils to take part in the Tech Treasure Hunt

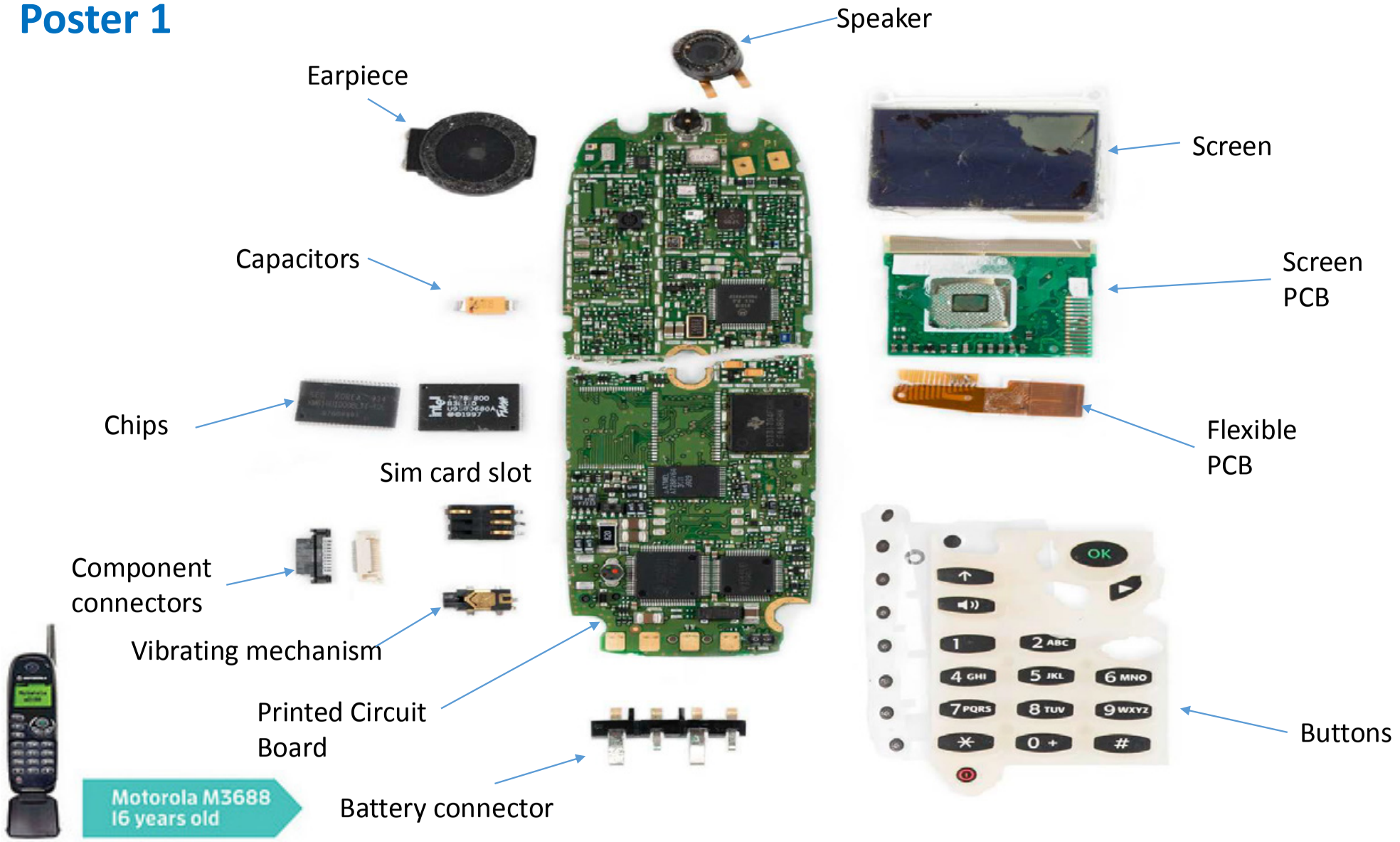
Tech Treasure Hunt | Activity Pack | Recycle Your Electricals

Teachers Resources

What is inside a mobile phone?

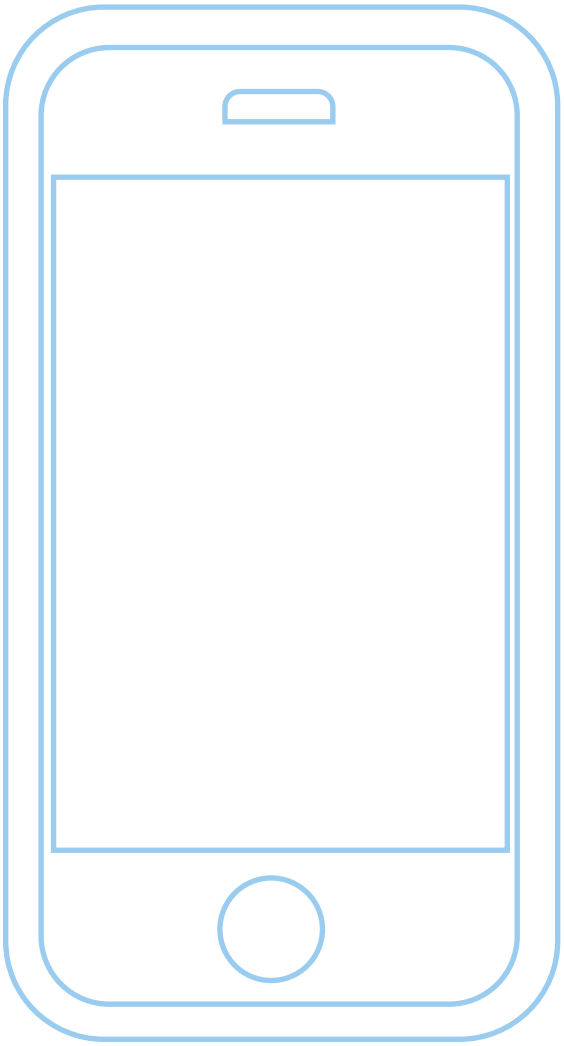
(Diagram from Fairphone website)

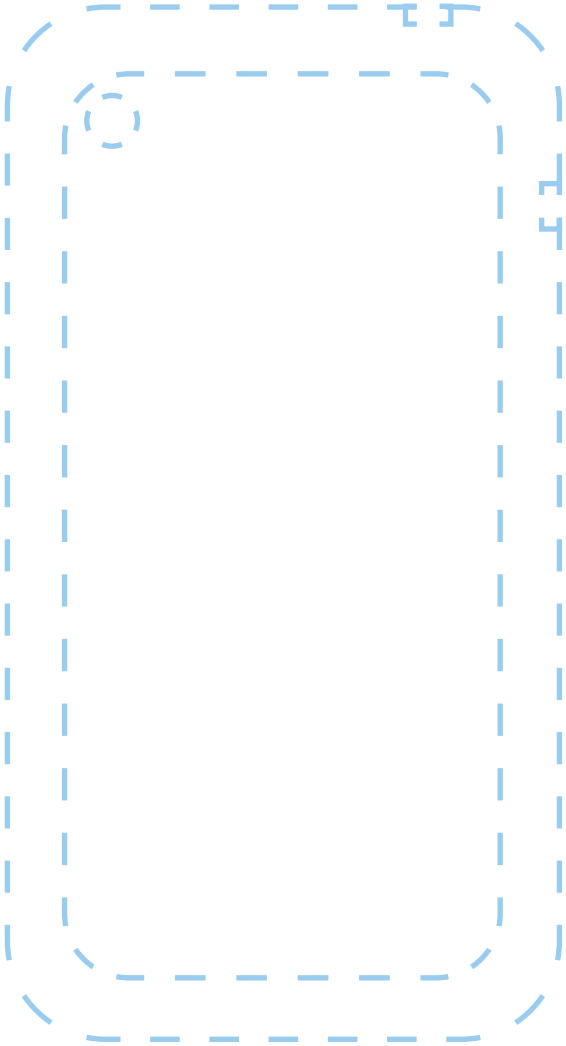
Poster 1



Poster 2

Worksheet 1





Draw the different parts of a mobile phone