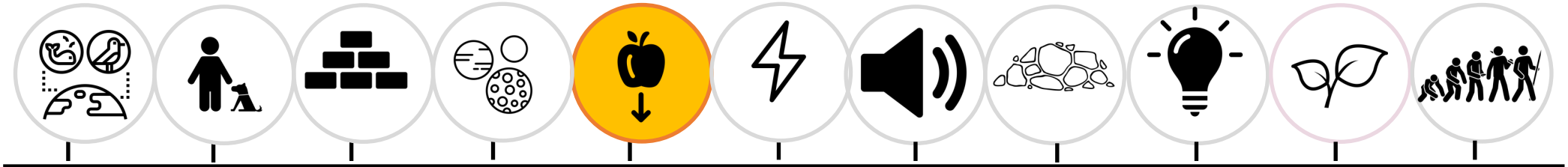
Year 3: Forces

SCIENTIFIC CONTEXT: Forces and Magnets



KEY VOCABULARY:

Magnetism	*A magnet is a rock or a piece of metal that can pull certain types of metal toward itself.*
North pole	A magnet has two ends, called *poles. One end is the north pole...*
South pole	and the other is the south pole .
Attract	Certain metals are attracted to magnets, meaning that they are pulled in by the magnet's magnetic field. Magnets also attract one another, opposite pole to opposite pole.
Repel	The same pole will repel each other – their magnetic fields will push each other away.
Push	A push is when you use force to move a thing (object) away from you
Pull	A pull is when you use force to move a thing (object) closer to you.

How do things move on different surfaces?

Do forces always need contact between two objects?

What materials are magnetic?

What are magnetic poles? What will happen if we put north and south pole together?

As Scientists we will:

- Compare how things move on different surfaces,
- Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance,
- Observe how magnets attract or repel each other and attract some materials and not others,
- Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials,
- Describe magnets as having 2 poles,
- Predict whether 2 magnets will attract or repel each other, depending on which poles are facing.

Working scientifically:

- Gather, record and present data (in a table or bar chart) to help in answering questions,
- Make careful observations,
- Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables,
- Set up simple practical enquiries, comparative and fair tests.

Notable scientist: Leonardo Da Vinci

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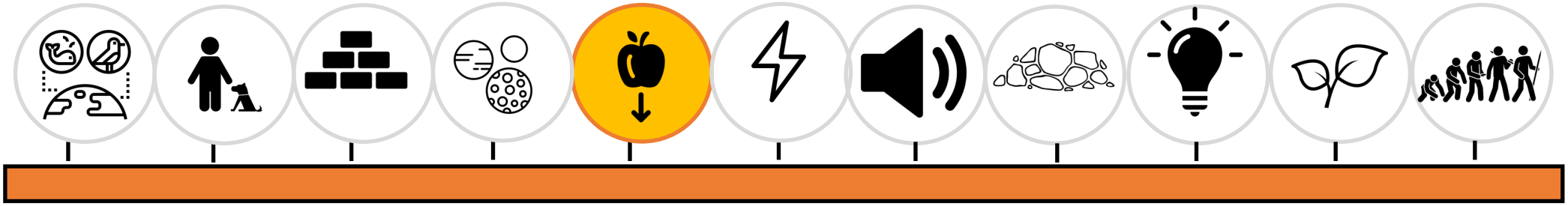

Prior Learning:

Explore the natural world around them and describe what they see, hear and feel whilst outside. (Reception – Forces)

Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)

What I need to know:

A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes. A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract.

Opportunities for science capital:

- Forces and magnets workshop at We are the Curious.

- Workshops with *Working Science*.

Part of science capital includes scientific media consumption- documentaries, reports etc. So, I have added a couple of links which give daily science news for children. Checking in on these every now and then would be beneficial to help children see science in the wider world.

https://www.sciencenewsforstudents.org/

https://www.sciencejournalforkids.org/

Assessment:

By the end of the topic, children should be able to: Compare how things move on different surfaces,

Describe that magnetic force can act at a distance, compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials, describe magnets as having 2 poles and predict whether 2 magnets will attract or repel each other, depending on which poles are facing.

When working scientifically, they should be beginning to: gather, record and present data (in a table or bar chart) to help in answer questions, make careful observations, record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables and set up simple practical enquiries, comparative and fair tests.

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Theme 1: How do things move on different surfaces?

Starter:

Recap: what have learnt in science so far? Recap learning on rocks and soils by creating a Kahoots quiz (free to sign up) and playing at the beginning of this topic.

Complete KWL grid.

Main:

Substantive knowledge:

Write the word "force" on the whiteboard and ask the children what they think this means. They should already know that a force is a push or a pull, but point out that pushes and pulls can be combined to create other movements, such as a twist.

Organise the children into groups of three or four. Ask the groups to discuss and write down what happens to an object when a force is applied to it. Tell them to give real-life examples to illustrate their points, such as pulling a handle to open a door or pushing a toy car to make it move. Give them a few minutes to do this.

Play film: https://www.tigtagworld.co.uk/film/what-is-a-force-PRM00083/

Disciplinary knowledge: comparative/fair test

Working scientifically objective: Gather, record and present data (in a table or bar chart) to help in answering questions.

Today we are going to be mechanical engineers

Discuss the purpose of an escape lane and the kind of surfaces which could be used to slow down vehicles. Explore how far cars go after a hill (down a ramp). In small groups discuss how they will measure how far the car goes on different surfaces and how they can record this. Emphasise that we are testing the surface, so everything else must stay the same to be fair – as a class, list the control variables.

Generate success criteria with the children for drawing tables.

Plenary/assessment:

Groups investigate with each pupil drawing their own results table. Children could self assess their results tables against the success criteria.

Ask children to explain how the surface makes a difference.

Full TAPS plan with assessment criteria: Car ramps

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Theme 2: Magnetic poles

Starter:

Recap: Explain to an alien what a force is.

Uses for magnets: Arrange the children into groups of four or five. Give each group a sheet of paper. Ask the children to think of as many uses for magnets as they can. Ask a few children to offer suggestions. They might want to start by thinking of times when magnets are used to attract each other. For example, to keep a fridge door shut. If they struggle, point out that every motor contains a magnet. This should help them identify many varied uses.

Main:

Disciplinary knowledge: Make careful observations

Investigative exploration:

Set up a range of magnets on each table and allow the children to investigate and explore. After 5 minutes, ask:

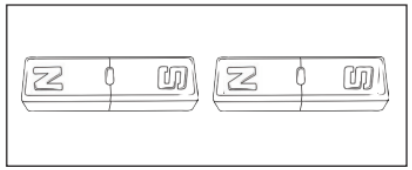
What happens if we put two of the same end together?

What happens if we put the opposite ends of a magnet together?

Children should observe how magnets attract or repel each other. Introduce the vocabulary attract, repel, north pole and south pole. Now you have introduced these concepts, give pupils another 5 minutes to explore these concepts for themselves.

Substantive knowledge:

Play video and complete activity 1 quiz: https://www.bbc.co.uk/bitesize/topics/znmmn39/articles/zhj9r2p



I think these magnets will

_____

Plenary/assessment:

Use diagrams of magnets and use knowledge of poles, attraction and repulsion to complete the sentence stems.

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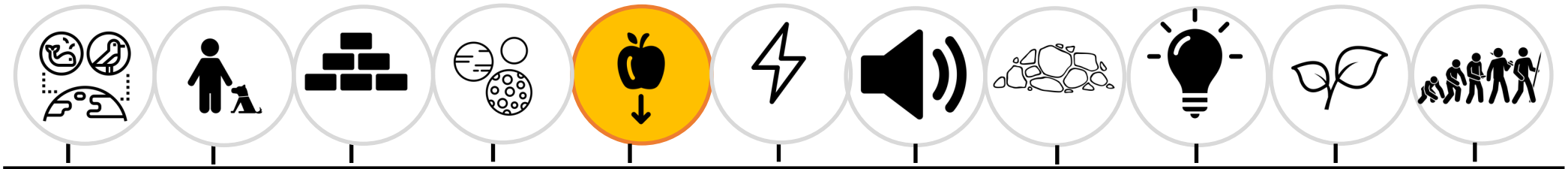

Theme 3: Magnetic or non-magnetic?

Starter:

Recap: A fun starter that can be taken outdoors! Pair children up and ask them to link arms (if they're comfortable to do so). One child puts on a sign labelled S (south pole); the other a sign labelled N (north pole). Linking arms, ask children to move around the playground/ hall. When you shout 'ATTRACT!' the pair have to link up with another pair ensuring the link has been made with the opposite pole (e.g. child labelled S has linked arms with a child labelled N). Start again, shout 'REPEL!'. Children act out repelling with another pair, ensuring this action is being done between pupils that are the same pole. Repeat enough times so you're sure they all have a good understanding of magnetic poles.

Main:

Substantive knowledge:

Point out that magnets don't just attract each other, they can attract other materials. These materials are known as magnetic materials. Model with a paper clip emphasizing the point that, unlike push and pull forces, magnetic forces can act at a distance and don't need direct contact.

Disciplinary knowledge:

Grouping and comparing

Working scientifically objective: recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.

Today we are going to be game designers and are going to design magnetic mazes.

Link for plan: https://bam.files.bbci.co.uk/bam/live/content/zjyxxbk/pdf

In groups, ask children to:

1) Draw a maze onto a clear bottle with a marker pen.
2) Drop a coin or ball bearing inside the bottle and use a magnet to guide it through the maze.
3) Try doing the same with other objects (e.g. plastic button, marble, beads). Which ones work, and why?

Record findings and group materials in a venn diagram (magnetic/non-magnetic).

Plenary/assessment:

Ask: What do you notice about the magnetic objects? Is there a pattern? What are they all made from?

<u>Watch out for common misconception that all metals are magnetic! Can explore this more later.</u>

Odd one out: give children a picture of 3 different items, some magnetic, come not and ask them to identify the odd one out based on this.

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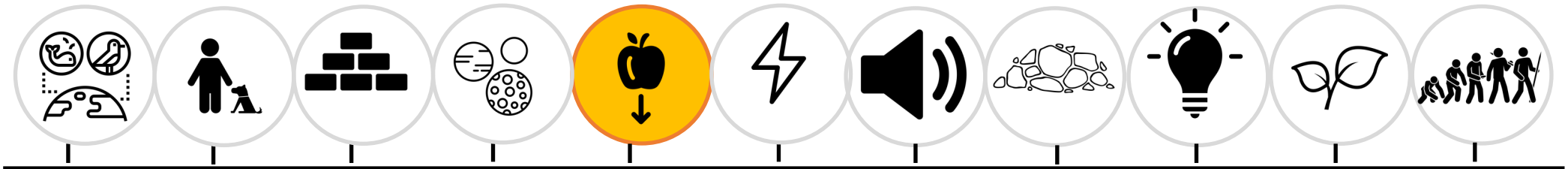

Theme 4: Which magnet is strongest?

Starter:

Recap– present children with pictures/words of different everyday objects made from different materials and ask them to sort into magnetic/non-magnetic.

Investigative exploration:

In our last lesson, we found out that only some metals are magnetic. Put which metals are these? Present children with a range of metals and allow them to explore their magnetic properties. Could record observations, but not essential here.

Main:

Disciplinary knowledge:

Comparative/fair test

Working scientifically objective: Set up simple practical enquiries, comparative and fair tests.

Today we are going to be physicists

Provide the children with a collection of magnets and other materials (e.g. card, fabric, tissue, thin wood, aluminium foil, paperclips) to first explore.

Independently (as this is the assessment focus for each child) ask pupils to find out and write down as many different ways as they can to test whether the magnets are all equally strong *e.g. through paper/card or layers of each, how close magnet needs to be before it attracts a paper clip, how many paperclips it can hold etc.*

As a class, complete the comparative/fair test planning sheet with 'type of magnet' as the only variable you can change. Guide discussions on what they would need to keep the same in order to make it a fair test. For example, would it be fair if I used a bar magnet to pick up lots of little paper clips, but in the next test I picked up really big paper clips with a horseshoe magnet?

See full TAPS plan: Which is the strongest magnet?

Plenary/assessment:

Disciplinary knowledge:

Pupils carry out investigation to answer, which magnet is strongest?

As the assessment focus is setting up practical enquiries, children do not need to record results.

Complete KWL grid.