Subject: Science Year 3 – Forces and magnets

NC/PoS:

- compare how things move on different surfaces
- notice that some forces need contact between two 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 two poles
- predict whether two magnets will attract or repel each other, depending on which poles are facing.

Prior Learning (what pupils already know and can do)

Check the children can recall the following ways of using forces to change the shape of materials from the unit *Science, Year 2, Uses of everyday materials*: *squashing*, bending, twisting, and stretching.

End Goals (what pupils MUST know and remember)

- Know a force can, make things slow down or speed up.
- Know when an object moves on a surface, the texture of the surface and the object affect how it moves.
- Know moving objects slow down quickly on rough surfaces.
- Know moving objects do not slow down much on smooth surfaces.
- Know that for some forces to act, there must be contact e.g., a hand opening a door, the wind pushing the trees
- Know that magnets do not need to touch objects for a force to occur
- Know most magnets have a North pole (N) and a South pole (S)
- Know a North and South pole attract and like poles repel
- Know monopole magnets only have one pole
- Know only some materials are attracted to magnets – steel and iron

Key Vocabulary: magnetic, non-magnetic, iron, steel (an alloy of iron), nickel, bar magnet, North pole, South pole, opposite, like poles, non-contact, magnetic force, bar, horseshoe, repel, attract, push, pull, contact force, average, compare, presenting data

Session 1: Use resources from Kapow Lesson 1: Pushes and pulls

Recap and recall: Using modelling dough mime and name the actions stretch, squash, roll, bend and twist. Turn your back to the class and perform one of the actions. Present the modelling dough to the class and ask them to vote on the action used. Reveal the answer after each vote. Explain that the actions that change the shape of the modelling dough require a force.

LO: To describe the effects of contact forces.

Working scientifically LO: To label a diagram using arrows and scientific vocabulary.

Using the ***Attention Grabber,*** provide each pair with a tennis ball and get them to record on a whiteboard as many different actions that they can find to make the tennis ball move. Collect responses and collate them on a class table in your Floorbook- use the *Presentation: Pushes, pulls and twists* as a model.

Use the ***Main Event*** section of the lesson to explore contact forces. The challenges suggested in the *Presentation: Contact Forces* can be modelled by the teacher (children can be chosen to help) and the questions relating to each challenge answered as a class.

Use the *Presentation: Force diagrams* to model how to draw a force diagram. In their books children choose a diagram to draw and include a labelled force arrow (do not use the worksheet unless as an adaption).

Use the ***Wrapping Up*** section to finish.

Do Lesson 4,5 and 6 first.
Session 2: Use resources from Kapow lesson 4: Magnets
Recap and recall: Use the 'True or False' activity to recap and recall contact forces
LO: To describe the effects of magnets.
Use the ***Attention*** **Grabber** to introduce the force 'magnetism'.
Working scientifically LO: To write a method.
Use the ***Main Event*** section to introduce the key vocabulary and model how to write a method. Using suggestions from the children write a whole class method that can be put in the floorbook.
Children can then use the mehod to investigate the enquiry question- take photos for floorbook if possible.
Vocabulary: attract, magnet, magnetic material, magnetism, method, non-contact force, non-magnetic material, north pole, repel, south pole

Session 3: Use resources from Kapow lesson 5: Investigating magnet strength
Recap and recall: Use the *Presentation: Magnetic materials* to classify **magnetic materials** or **non-magnetic materials**.
LO: To compare the properties of different types of magnets.
Use the ***Attention Grabber*** check understanding of attracting and repelling poles.
Do the pattern seeking activity using *Pupil video: Investigating magnet strength* and children record results.
Working scientifically LO: To display data using a bar chart.
Model how to put these results onto a bar chart and then allow the children to complete their own in their books. You can provide the **Activity: Magnet strength bar chart** worksheet as the focus should be on how to label and complete the bar chart and this may be lost if they are trying to draw axes of their own.
Use the ***Wrapping Up*** section to address any misconceptions.
Vocabulary: bar chart, record, results

Session 4: Use resources from Lesson 6: Uses of magnets
LO: To explain the uses of magnets.
Use the Recap and Recall 'True or False' to discuss statements about magnets.
Working scientifically LO: To research the uses of magnets.
Use the ***Attention Grabber*** and ***Main Event*** sections to allow the children to research the use of magnets. This research could be done in groups/pairs or with support using the resources provided. Children then report back their findings at the end of the lesson. Those who are able could record their findings in their books.
Vocabulary: electromagnet

Session 5: Use resources from Kapow lesson 2: Friction
Use the ***Recap and recall*** to identify pushes, pulls and twists.
Use the ***Attention Grabber*** to explore forces and their effects.
From the ***Main Event*** section use the *Presentation: Friction* to introduce the effects of friction.
Demonstrate rolling the ball across the front of the classroom again and move onto the investigation below once you have established their understanding of the following:

- **When the ball was rolled along the floor, which two surfaces rubbed together?** (The surface of the ball and the floor.)
- **What force did this create?** (Friction.)
- **Why did this slow the ball down?** (Friction acts in the opposite direction to movement, causing objects to slow down or stop.)

LO: To recognise the effects of friction on an object moving across different surfaces
Using cars on ramps children measure the distance travelled and record results as a class in a table for the Floorbook. Pick 4 different surface materials. Ensure to take an average of 3 readings. Rotate the jobs so that different children get to help, but this can be led by the teacher as the focus of the lesson is on drawing a scientific conclusion.
Working scientifically LO: To write a scientific conclusion identifying cause and effect
Give reasons for their results e.g.
The car travelled furthest (…cm) on the plastic surface because it was smooth compared to the sandpaper.
This was greater than the distance travelled on the sandpaper, which was …cm.
As the sandpaper is rougher than the plastic, this suggests that the rougher the surface, the more friction is produced.
Vocabulary: friction, cause, effect, conclusion, centimetres

Session 6: Use resources from Kapow lesson 3: Investigation friction
Recap and recall: Use the *Presentation: Is friction useful?*
LO: To interpret how and why things move differently on different surfaces.
Use the ***Attention Grabber*** to draw the children's attention to how surface roughness affects the amount of friction.
Working scientifically LO: To plan an investigation using variables.
Use the ***Main Event*** section to measure the **effects** of friction and to discuss the variable they need to change.
The aim of this lesson is to understand and plan an investigation using variables- not gathering of data. The investigation can be carried out as a class and data collected but this does not need to be recorded by the children.
Complete the Unit Quiz
Vocabulary: investigation, plan, variable

Link to career scientist:
https://pstt.org.uk/application/files/2116/2851/6350/Mechanical_Engineer_-_Rafsan_Chowdhury.pdf

https://pstt.org.uk/application/files/7516/2851/6241/Civil_engineer_-_Jyoti_Sehdev.pdf

Scientists who have helped develop understanding in this field: Galileo Galilei