Year 3/4 Science – Forces and Magnets

National Curriculum links:

- 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.

Working Scientifically

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

Prior Knowledge

• 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)

Key Vocabulary

- Force
- Non-contact force
- Contact force
- Air resistance
- Friction
- Gravity
- Magnets/magnetism
- Magnetic/Non-magnetic
- Magnetic field
- Repel
- Attract
- Poles
- Materials

Assessment

Children will:

- Know that a force is a power or strength that can cause an object to move.
- Know that non-contact forces are forces that act without objects touching and that examples of these are gravity and magnetism
- Know that contact forces are forces that act when objects touch each other. Examples of these are friction, air resistance and water resistance
- Describe the impact that a force has on an object
- Know that when there is a lot of friction/air resistance an object will slow down.
- Know that friction is the force that acts between two objects; it slows down or stops and object's movement.
- Know that different surfaces can create stronger friction forces.
- Know that magnets are materials or objects that produce a magnetic field
- Know that magnetism is a non-contact force
- Know that magnets have a north and south pole
- Know that like poles repel and differing poles attract and will identify situations when they do so
- know that magnetic materials are usually made from iron (inc. steel) and nickel
- be able to compare and group materials based on their magnetic properties.
- Understand some everyday uses of magnets
- Understand that magnets can have different strengths

Expectations of learning	National Curriculum Link (s)	Learning Journey
By the end of the lesson / session children should be able to: • Know that a force is a power or strength that can cause an object to move. • Know that non-contact forces	• notice that some forces need contact between two objects, but magnetic forces can act at a distance	Refer to DE Year 3 Forces and Magnets session 1 Starter – what is a force? Assess children's current understanding. Ensure understanding that a force is a power or strength that can cause an object to move.

are forces that act without objects touching and that examples of these are gravity and magnetism • Know that contact forces are forces that act when objects touch each other. Examples of these are friction, air resistance and water resistance • Describe the impact that a force has on an object • Know that when there is a lot of friction/air resistance an object will slow down.		Explain that forces are happening all around us and in everything we do. Some of these forces are contact forces and non-contact forces share definitions of these and give the examples given in the expectations of learning. Note: air resistance needs clear explanation as air particles are making contact with an object but children don't see this. Have some equipment in class to demonstrate different forces – sandpaper/wood, ball rolling on the ground, asking the children to jump, something travelling across the sink. What forces can they see in action? Activity – give children a variety of pictures with forces in action (only including the forces referred to in this lesson). Children to label the forces on the images.
Expectations of learning	**National Curriculum Link (s)**	**Learning Journey**
By the end of the lesson / session children should be able to: • Know that a force is a power or strength that can cause an object to move. • Know that friction is the force that acts between two objects; it slows down or stops and object's movement. • Know that when there is a lot of friction/air resistance an object will slow down. • Know that different surfaces can create stronger friction forces.	• compare how things move on different surfaces • notice that some forces need contact between two objects, but magnetic forces can act at a distance • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results,	**Two sessions – Comparing how things move on different surfaces.** **Session 1 – Knowledge and Planning** Starter – assess previous lessons knowledge – purple mash has a quiz for this – search type of forces quiz. (Will record scores on PM and you will see common questions that went wrong). You can also add/adapt questions on this. Go over the definition of friction and how it works as a contact force. Explain that it plays a role in slowing objects down. Discuss what may affect an object moving across a surface (on a solid surface would be roughness, texture and composition of the surface). Ask children to think of examples of this in action i.e. bowling alleys, skating rinks, tennis courts, could even think about ball pools. Children to plan out an investigation to see the effect of friction in real life. Show children the ramp equipment that comes with the data loggers. The ramp comes with three surfaces, however, children can make their own surfaces to add to this – use materials from science/art. Plan the investigation – coming up with the question together, but children to think about the variables involved (independent, dependent and control, don't need to remember these but introduce them now). Create a prediction. **Session 2 - Investigation and conclusion** Discuss key features of a fair and accurate investigation: multiple measurements and control variables.

	in oral and written forms such as displays and other presentations	Complete the investigation using the ramp and data loggers, organise turn taking for the children. Children to record their data in tables (drawing them themselves unless inappropriate i.e. SEN). Children to write a conclusion .