SS John Fisher & Thomas More Catholic Primary School

A Voluntary Academy

Year Group: Year 3 & Year 4	Term: Spring 1 (Cycle A)	Topic: Forces and Magnets

National Curriculum Links

Pupils in Key Stage Two should be taught to:

- 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

- ask relevant questions and using different types of scientific enquiries to answer them
- set up simple practical enquiries, comparative and fair tests
- make systematic and careful observations and, where appropriate, taking accurate measurements using standard units and a range of equipment
- gather, record, classify and present data in a variety of ways to help in answering questions
- record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identify differences, similarities or changes related to simple scientific ideas and processes
- use straightforward scientific evidence to answer questions or to support their findings.

Prior Learning	Future Learning
• Explore how things work (Nursery – Forces) • Explore and talk about different forces they can feel. (Nursery – Forces) • Talk about the differences between materials and changes they notice. (Nursery – Forces) • Explore the natural world around them. (Reception – Forces)	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces) • Identify the effects of air resistance, water resistance and friction that act between moving surfaces. (Y5 - Forces)

• 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)	• Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces) • Magnetic fields by plotting with compass, representation by field lines. (KS3) • **Earth's magnetism, compass and navigation. (**KS3)

Common Misconceptions

Some children may think:

- the bigger the magnet the stronger it is
- all metals are magnetic.

Sustainable Development Goals & Catholic Social Teaching

These Sustainable Development Global Goals would be perfect to fit with this unit of learning:

These Catholic Social Teaching strands would be perfect to fit with this unit of learning:

Add activities here

Applied Write Opportunities	Enrichment Opportunities

Assessment Opportunties

- Can use their results to describe how objects move on different surfaces
- Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface
- Can use classification evidence to identify that some metals, but not all, are magnetic
- Through their exploration, they can show how like poles repel and unlike poles attract, and name unmarked poles
- Can use test data to rank magnets

Key Vocabualary

Tier Two: Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole

Tier Three:

Knowledge and Skills Objectives	Activity	Differentiation
Lesson One I know that some forces need contact between two objects. Working Scientifically	**Copy all planning over from Joshua's plan**	

I **Resources** =		 **Plenary** =

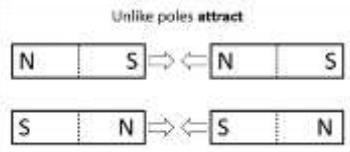
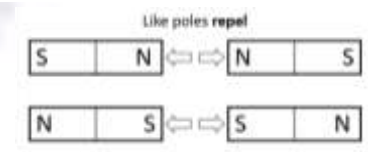
Knowledge and Skills Objectives	Activity	Differentiation

Lesson Two I can compare how things move on different surfaces. **Working Scientifically:** =	Hook: Starter Question: Ask the children; Introduction: Task 1: Task 2:	Task 1 SEN: Year 3: Year 4: Challenge: Plenary
Resources		

Knowledge and Skills Objectives	**Activity**	**Differentiation**
Lesson Three I can compare, group and identify everyday materials on the basis of whether they are attracted to a magnet. **Working Scientifically:**	**Hook:** **Starter Question:** **Ask the children;** **Introduction:** Task 1	Task 1 SEN: Year 3: Year 4: Challenge: Plenary

Resources		

Knowledge and Skills Objectives	Activity	Differentiation
Lesson Four I can explain how magnets work. Working Scientifically	**Hook: a range of magnets** **Starter Question:** **Show the children both ends of a magnet.** **Ask the questions;** ***What will happen when I put these two magnets together?*** ***Do both ends of a magnet act in the same way? If not, why not?*** **Children to discuss with their Talking Partner before discussing as a whole class.** **Introduction:** Explain what a magnet is: **'Magnets are pieces of metal or rock with an invisible power to attract** special kinds of metal. That power is called a force. In nature, a force is something that causes a push or a pull. Magnetism is the force that makes a magnet stick to your refrigerator. **Magnetism is at work all around you'.** Task 1: Give children two bar magnets or so that they can explore what happens when magnets are placed near one another. What do they notice?	Task 1 Make a compass. Everyone Take photographs of the children observing the compass modelled. Stick photographs in the book following the activity. Children to write a sentence about what a compass is and how it works. WAGOLL A compass is a tool used for finding direction. A magnetic needle on a pivot spins freely until it finds north. It points **north because it lines up with Earth's lines** of magnetic force. Task 2: Record understanding of attracting and repelling SEN:

	Discuss with the children; **'One end of a magnet is called 'North Pole'** and the other end is called **'South Pole'**. These names are used because if you hang a magnet from a **thread, the magnet's North Pole points (almost) towards the north** direction. This is because the **Earth's co**re (its centre) is a large magnet. It is made up of the metals nickel and iron. Your little magnet lines up with **Earth's magnetic core, and so points north'.** Give the children a compass to look at and explore if they can find north. Model how magnetic Earth works by either tying some string around a magnet or make a compass following the instructions attached.  <u>Task 2:</u> Next, introduce the terms; repel or repulsion and attract. Explain; **'If you hold two magnets the** ***wrong way*** around, they push apart - they repel! In other words, if you hold two magnets together so that like-poles are close together (two norths OR two souths), they repel. It feels like the magnets are surrounded by an invisible rubber layer pushing them apart. That invisible layer is called a magnetic field. **It's only when you hold unlike**-poles together (a north pointing to a south) that magnets stick together. This is called attract. Now, the magnetic field **acts like a stretched rubber band pulling the magnets together'.** Give the children a variety of magnets (bar/wand/marbles/horseshoe) and continue to explore further. Can they feel the magnets attracting or repelling? Encourage the children to talk to one another to discuss what is happening and why.	Children to complete sentences and to identify which magnets show attracting and repelling. <u>Main Task:</u> Children to draw two magnets repelling and two magnets attracting. Children to explain what is happening. WAGOLL: Magnets have two poles. One called the North Pole and one called the South Pole. When opposite poles are near one another, they pull together. This means the two poles attract.  When two poles the same are near one another, they push away from one another. This means the two poles repel.  <u>Task 3:</u> Which magnet is the odd one out?

Resources A variety of magnets String Slice of cork Needle Bowl of water	Then watch this video to support understanding. https://www.bbc.co.uk/bitesize/topics/zyttyrd/articles/zpvcrdm <u>Task3:</u> Give children 3 different types of magnets; a bar, a horseshoe and a round magnet. Get the children to explore them and ask them which one is the odd one out? When children are exploring the magnets, encourage them to use scientific vocabulary; north pole, south pole, attract and repel.	<u>SEN:</u> **Record the children's thinking onto** Post-It notes and stick into book. <u>Main Task:</u> Children to draw the three magnets into their books, and explain which one they think is the odd one out and why. <u>Challenge:</u> Research about magnetic Earth; Draw a diagram of magnetic field lines around the Earth. **Plenary** Consolidate the terminology. Watch this video to consolidate all learning **from today's learning.** https://youtu.be/yXCeuSiTOug
Knowledge and Skills Objectives	**Activity**	**Differentiation**
<u>Lesson Five</u> I know that some forces need contact between two objects but magnetic forces can act at a distance. <u>Working Scientifically</u> I can set up a simple enquiry.	<u>Hook</u>: a variety of magnets **<u>Starter Question</u>** **Ask the children ;** ***How can you make something move without touching it?*** **Get the children to discuss with their Talking Partner before discussing as a whole class.** <u>Introduction:</u>	<u>Task 1</u> Magnetism is an invisible force <u>Everyone:</u> Stick in image and write a sentence or paragraph about the invisible force.

Resources

Loads of metal paper clips
Paper
Variety of magnets
Objects for the investigation

Give the children some paper clips and asked to think about how they can make it move without touching it.
Have some magnets close by. Observe the children as they investigate this. The children will probably place the magnet close to paper clips and see them quiver and possibly pull towards the magnet. Once they have done this, ask them if they can move the paperclips over a greater distance, still without touching the paperclips. The aim is for the children to place a magnet under a piece of paper or the table to move the paper clips from one place to another. Allow the children to problem solve – if they are not realising that they could place an object between the magnet and the paper clips, offer the suggestion.
*take photographs of children doing this, and listen into the discussions. Record some of **the children's ideas onto flip chart paper or post**-it notes to reflect on as a whole class later.

Task 1:
Discuss:
'Magnetism is an invisible force.
In order for the magnet to move, they had to place the magnet under a material to make it move. The paper**clip wasn't touched by them. The invisible force moved it.'**

Explain to the children that they are going to make a magnetic track or maze to explore the invisible force of magnets. You could provide the children with magnetic tracks or invite the children to make their own.
Remind the children that a magnetic force can work through solid materials, so with a strong magnet under the table you will be able to move your magnet items along the track as if by magic!

SEN: Stick in image.
Children to write a simple sentence about magnetism being an invisible force.
Main Task (Stick in image of the children exploring the invisible force of magnetism)
Children to write a prediction complete a table of results and write a conclusion.

WAGOLL
Prediction:
I think the invisible force will attract only through some of the materials. **I don't** think the force will travel through the mug because the centre of the mug is hallow and wide. I do think the force will travel through the tinfoil because tinfoil is made of metal.

Method and results:

Conclusion:
I found out that not all materials allowed **the magnet's invisible force to travel** through it. I think this happened because some materials are thicker than others, such as, the wall is thicker than paper. If **the paper was a thick as the wall, I don't**

Get the children to challenge one another by;

- Moving their magnetic item all the way along the track without touching the sides
- Getting to the end in the fastest time
- Racing with someone else
- Chasing someone else, e.g. cat and mouse

*take further photographs of the children exploring magnets.

Children to write about magnets being an invisible force in their book.

Task 2:

Ask the children if they think all materials will allow the invisible force of a **magnet to work through it. Generate children's hypothesis & record on w/b** paper.

Explain to the children that we are going to investigate this. Show the children 10 materials e.g. tinfoil, school jumper/cloth, a ruler/plastic lid, a workbook/thick card, wipe-board, table, plastic chair, the classroom wall, a classroom window, a teachers mug.

Invite the children to predict whether a magnet could hold the paperclip in place from the other side.

Children to complete the table and write about their thinking.

Name of object	Main material (if known)	Is the paperclip still attracted to the magnet?	
		Predict	Measure

Next, discuss the method.

1) Place the magnet on one side on an object.
2) Place the paper clip on the other side of the object.
3) Lift up the object with the magnet on the top - does the

think it the invisible force would be able to travel through it.

If I was going to do this investigation again, I would have to make it fair. I would do this by having the same thickness of materials.

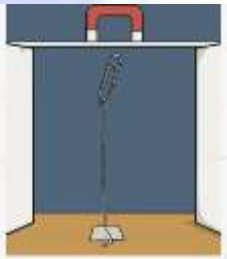
Challenge:

Children to think about if the size of the magnet is important?

Explain.

Plenary

Quiz the children on their knowledge about forces and magnets to date.

	paperclip fall away from the object? Following the task, discuss with the children what they have found out and why. Children to write a conclusion in their books.	
Knowledge and Skills Objectives	Activity	Differentiation
Lesson Six **Working Scientifically:**	**Hook: loads of paper clips in a chain, a box of paper clips, magnets** **Starter Question:** **Ask the children.** ***Can you make a paper clip float in the air?*** Discuss with Talking Partners before discussing as a whole class. Introduction: Consolidate how magnets have an invisible force around them. Give them all a paper clip, and invite them to try and make it float in the air. Invite the children to suggest how they could do this, and test out some of their hypothesis.  In order to make the paperclip float, the children need to attach the paper clip to a piece of string and to the table. Using a magnet, the child can make the paper clip fly. Task 1: Explain	Task 1 Animal and skeleton match SEN: Match 1 of each animal type Year 3: Match several animals including **one that you wouldn't expect to have an** endoskeleton. Year 4: Match several animals including an odd one out. Challenge: Read

Resources		
Images of animal and their skeletons Animal skeletons to sort and animal skeletons to stick into their book Sorting hoops Animal pictures (pairs)		
Knowledge and Skills Objectives	**Activity**	**Differentiation**
Lesson Seven **I know skeletons differ between animals.** **Working Scientifically:** I	**Hook:, animal figures including invertebrates.** **Starter Question:** **Ask the children.** ***Do*** Discuss with Talking Partners before discussing as a whole class. Introduction: Task 1: Watch the	Task 1 Sorting animals SEN: Children to be given headings and 1 of each to match. Year 3: Children to sort animals with headings. Year 4: Children to sort without headings. Children to consider headings and write their own. Challenge:

Resources		
Applied Write Opportunities: Add these to the plan		
Enrichment Opportunities: Add these to the plan		
Assessment Opportunities		

- Can use their results to describe how objects move on different surfaces
- Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface
- Can use classification evidence to identify that some metals, but not all, are magnetic
- Through their exploration, they can show how like poles repel and unlike poles attract, and name unmarked poles
- Can use test data to rank magnets

Key Vocabulary

Add these to the plan

Tier Two: skeleton,

Tier Three: pelvis,

Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole