Brough Primary School – Curriculum Intention Plan 2024 - 2025

Subject: Science **Year Group:** Year 5/6		**Area of learning: Forces**
Links to previous work/Remember when	• Learning in Year 3 regarding forces and magnets, when children learnt that some forces require contact and some such as magnetism can work from a distance. • Learning in Year 3 when children learnt about the forces of attraction and repulsion. • Learning in the previous series of lessons regarding Earth and space – link to gravity and why gravity exists. • <u>Working Scientifically</u> • being able to ask and investigate relevant scientific questions. • setting up simple scientific enquiries. • making systematic and careful observations. • gathering, recording and presenting data. • reporting on findings both oral and written. • using results to draw simple conclusions • using straight forward scientific evidence to support what they have found out.	
Term	**Year 5/6**	**Key Skills to be taught**
Autumn 2 2024 What the children should know at the end of this series of lessons		• Explain that unsupported objects fall towards the Earth because of the force of gravity acting on the Earth and the falling object. • Identify the effects of air resistance, water resistance and friction that act between moving surfaces. • Recognise that some mechanisms, such as levers, pulleys and gears, allow a smaller force to have a greater effect. <u>Working Scientifically</u> • Develop their knowledge of planning different scientific investigations to answer questions, including recognising and controlling variables. • Continue to use scientific equipment to measure but with increasing accuracy. • How to record data in increasing complexity through diagrams, labels, tables, bar and line graphs. • Using test results to make predictions and set up comparative and fair tests. • Reporting and presenting findings from investigations in oral and written forms for display and other presentations. • Identify how scientific evidence has been used to support or discount ideas and arguments.

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Vocabulary Mass, Earth, gravity, gravitational pull, weight, pull, push, friction, newton meter, Sir Isaac Newton, force, surface, investigate, conclusion, slowing, heat, air resistance, drag, streamlined, air molecules, water resistance, upthrust, float, buoyancy, sink, mechanism, pulley, gear, lever, load, pivot.

Sequence of learning	**Learning Objectives/Outcomes**	**Suggested lesson outline**
1 Explorify 'Have you ever tried to keep a balloon in the air' could be used as a starter.	**Learning objective:** I can explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and falling objects. **Key knowledge:** When any object is dropped, gravity pulls it down towards the centre of the Earth. Gravity is a force which acts at a distance. E.g. The planets orbit the Sun due to the force of gravity. **Enquiry Type:** Develop their knowledge of planning different scientific investigations to answer questions, including recognising and controlling variables.	**Recap –** Complete a pre-assessment activity to answer the question 'What happens when an object is dropped?' **Gravity and third law of motion** Demonstrate tennis ball falling. Discuss why it fell and didn't just float. Ask why the ball stopped at the table and didn't get sucked into the ground towards the centre. (Newton's third law of motion – for every action, there is an equal and opposite reaction). Introduce the investigation – "Do objects fall at the same rate?" In pairs, give the children a few minutes to talk about what they would do to investigate this question. Take feedback from the class – what will be their method of testing (what will they do?) Which variables will have an effect on their investigation and therefore they will need to control/keep the same? (e.g. height from which the objects are dropped, when the stopwatch is started). What will they measure? How will they record their results? Discuss as a class before the children complete the 'fair test planning sheet'. *Children complete fair test planning sheet or plan in their books. After carrying out their investigation, a discussion should take place about air resistance if*

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		appropriate, before the children write up their results.
2	**Learning objective:** I can identify the effect of friction between two moving surfaces. **Key knowledge:** Friction is a force created between two surfaces when they rub together. Friction is very useful, e.g. shoes on ground, car tyres on road. It can also not be useful, and we use oil and lubricants to reduce friction on things like bike gears. **Enquiry Type:** Using test results to make predictions and set up comparative and fair tests.	**Recap –** What do we mean by the word force? What simple forces can you remember? (Pushes and pulls) **Friction – good and bad** Friction is a force which acts on many things all of the time. It is sometimes called thee force that slows things down, but it does much more than that. There are times when we rely on lots of friction, and times when we try to reduce friction. *Children record a prediction for picking up jelly cubes, one soaked ion oil and the other not. Record outcome. Children look at a number of scenarios which use a lot of friction and ones that don't and sort them into two groups. Finally, as a whole class look at pictures of a skateboarder, skier and cyclist and discuss what forces are acting on each person.*
3 Explorify Odd One Out 'Best foot forward' could be used as a discussion starter.	**Learning objective:** I can plan different types of scientific enquiries to answer questions, including recognising and controlling variables. I can take measurements using a range of scientific equipment. **Key knowledge:** Friction is a force between two surfaces when they rub together. Friction creates heat and slows down an object. A smooth surface creates less friction than a	**Recap –** What do we mean by the word friction? Give an example when friction is useful? What about not useful? **Friction Investigation** We are going to plan and carry out an investigation about whose shoe creates the most friction. How could we do this? What variables must remain the same, what could change? What could we measure? *Children plan the investigation, identifying the variables, how the test will be fair, a*

	rough one. To measure force, we use a newton meter. It is named after Sir Isaac Newton who first investigated different forces. **Enquiry Type:** Develop their knowledge of planning different scientific investigations to answer questions, including recognising and controlling variables. Continue to use scientific equipment to measure but with increasing accuracy. Reporting and presenting findings from investigations in oral and written forms for display and other presentations.	*method, a prediction and of course their newton meter readings and results. Results could be recorded as an email or text message to parents indicating the safest shoes to buy for their children.*
4	**Learning objective:** I can identify the effects of air resistance. **Key knowledge:** Air resistance is a force which acts in the opposite direction to gravity. It acts between a moving object and the air molecules around it. It is a type of friction. **Enquiry Type:** Identify how scientific evidence has been used to	**Recap –** What do we mean by the word force? Why does everything fall to the ground? How would you define friction? **Air Resistance** Parachutes are used to slow down parachutists by increasing air resistance so they can land safely. Modern cars and planes are streamlined to reduce air resistance, allowing them to move faster more easily. Design a paper aeroplane, then in groups investigate whose plane is the best. How will we know which is the best? What will we measure?

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	support or discount ideas and arguments.	*Children record the findings of a group activity, dropping a scrunched up piece of paper and a flat piece of paper, using scientific vocabulary. Children complete an information sheet about their plane, identifying forces, how the test would be fair and predicting which will be the best and why, before trying it.*
5 Explorify Odd One Out 'Sleek designs' could be used to start discussion.	**Learning objective:** I can identify the effects of water resistance. **Key knowledge:** Water resistance makes it difficult to move through water. It acts between the moving object and the water molecules. Bodies of aquatic animals are streamlined, narrow at both ends and broad in the middle. This means there is less water resistance dragging them back. We utilise the same features when designing and building objects that move through water. (Share video of ship with bulbous bow etc) **Enquiry Type:** Continue to use scientific equipment to measure but with increasing accuracy. How to record data in increasing complexity through diagrams, labels, tables, bar and line graphs.	**Recap –** What did we learn about air resistance? What example of air resistance being good can you think of? What about air resistance being bad? **Water Resistance** Would walking through water up to your waist be easy or hard? If we jump into a swimming pool, what stops us from hitting the bottom? Discuss in simple terms the forces acting on a moving boat. (Don't forget to show gravity and upthrust as well). Carry out an investigation using plasticine dropped through water. What shape creates the most water resistance and which the least? Measure the time it takes for your shapes to fall through the water. *Children record their group investigation of different plasticine shapes dropping through the water. Discus why we are making three measurements and what we could do with the data. In conclusion, children record which shape had the most resistance and why they think it was. They should also identify although not write as a plan, two things they did to keep the test fair.*

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6 There are a number of Exlporify resources that may be of use for this lesson.	**Learning objective:** I can identify simple mechanisms including levers, gears and pulleys that increase the effect of a force. **Key knowledge:** A mechanism is a device which takes an input motion or force and outputs a different motion or force. Mechanisms are used to make a job easier to do. There are many types but most commonly they are levers, linages, cams, gears and pulleys. **Enquiry Type:** Identify how scientific evidence has been used to support or discount ideas and arguments.	**Recap –** What do we mean by the word force? What is air resistance? Water resistance? How would understanding air resistance help you design a plane? **Pulleys, gears and levers** Pulleys are used to help you use a small force to lift a large load. An example would be the string on blinds. Gears can be used to change speed, force or direction of motion. An example would be a lower gear being used to cycle up a hill. Levers are also used to help a small force lift a large load. An example would be a seesaw. Carry out a simple investigation of a lever using a ruler, a pencil as a pivot point and a rubber. Discus how easy it is to lift the rubber using the lever as the pivot point moves backwards and forwards. *Children record the results as the pivot is moved and then explain those results based on what they found out.*
7	**Learning objective:** To demonstrate what has been learnt about forces.	ASSESSMENT LESSON Children will complete an assessment task, which could be summative, or it could be a quiz style assessment or written task which draws on the knowledge learnt.

Learning Outcome/product
During this unit of work, children will consolidate and extend their knowledge of forces by naming individual forces (e.g. gravity, friction, upthrust). They will extend their knowledge of frictional forces (air resistance and water resistance) and plan fair test investigations to discover which shoe has the greatest friction and which shapes offer the most water resistance. They will learn how forces can be helpful and unhelpful in various scenarios

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and identify the forces involved in each scenario. They will learn what a mechanism is and how pulleys, levers and gears are used to allow a smaller force to have a greater effect.

Assessment records	**List only those children who have not achieved the expected outcomes.**
	Please see assessments on Insight for each child.