

**St. Stephen's C.E Primary School**  
**The 'Aspire' Curriculum**

***Medium Term Plan***

**Subject- SCIENCE**

**Year Group – YEAR 5**

**Term- AUTUMN 2 – FORCES**

**NC Links:**

- To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- To identify the effects of air resistance, water resistance and friction.
- To identify the effects of air resistance.
- To identify the effects of water resistance.
- To identify the effects of friction.
- To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

***Common Misconceptions:***

- Children may think that heavier objects fall faster.
- Children may think that smooth surfaces do not generate friction.
- Children may believe that, when an object stops moving, the force acting upon it disappears.
- Children may think that there are no forces acting on a stationary object.
- Children may think that force has to keep being applied to keep an object in motion.
- Children may use the terms '*mass*' and '*weight*' interchangeably.
- Children may think that the pivot point of a lever is always best placed in the centre.
- Children may believe that a greater force applied to a mechanism will always have a greater effect.

**What has come before?**

- Floating and sinking (FS2)
- Compare how things move on different surfaces. (*Y3 - Forces and magnets*)

**What will follow?**

- Forces as pushes or pulls, arising from the interaction between two objects. (*KS3*)
- Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (*KS3*)
- Moment as the turning effect of a force. (*KS3*)

- Notice that some forces need contact between two objects, but magnetic forces can act at a distance. *(Y3 - Forces and magnets)*
- Observe how magnets attract or repel each other and attract some materials and not others. *(Y3 - Forces and magnets)*
- 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. *(Y3 - Forces and magnets)*
- Describe magnets as having two poles. *(Y3 - Forces and magnets)*
- Predict whether two magnets will attract or repel each other, depending on which poles are facing. *(Y3 - Forces and magnets)*

- Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. *(KS3)*
- Forces measured in Newtons, measurements of stretch or compression as force is changed. *(KS3)*

*Teaching sequence*

*Key Learning*

*Lesson outcome*

- ❖ *Stick in cover page*
- ❖ *Stick in knowledge organiser*
- ❖ *Stick in learning map*

**WEEK 1**

**LO: I can identify forces acting on objects.**

**Vocab:**

- *Air resistance*
- *Force*
- *Friction*
- *Gravity*
- *Water resistance*
- *Push*
- *Pull*
- *Thrust*
- *Opposing*

On your PowerPoint, show two images. What is the difference between the forces shown in each image? Children should identify that pushing a swing is a contact force and that a magnet attracting an object is a non-contact force.

Use your ASPIRE PowerPoint to reinforce the idea that forces are classified as either pushes or pulls. Hand out the Push and Pull Sorting Activity so that children can practise identifying pushes or pulls by sorting the images. Children may find that some images could be either a push or a pull depending on how the image is interpreted. This is intended to promote scientific discussion and

- *Add to learning map*
- *Retrieval practice*

**Task:**

Children are to draw arrows to identify the direction of the forces acting on an object. Can the children draw force arrows onto a diagram?

**Support:**

Provide children with a word bank of key words to use.

**Challenge:**

The children should label the forces in action and draw arrows to show the directions of the opposing forces. A blank box has been included to allow children to include their own example.

<ul style="list-style-type: none"> <li>• Accelerate</li> <li>• Decelerate</li> </ul>	<p>reasoning. Can the children identify forces as either pushes or pulls?</p>	<p>Ask a partner if they agree with the additional one that children have made.</p>
<p><b>WEEK 2</b></p> <p>LO: I can explore the effect that gravity has on objects and how the first theory of gravity was developed.</p> <p><b>Vocab:</b></p> <ul style="list-style-type: none"> <li>- Force</li> <li>- Gravity</li> <li>- Newton</li> <li>- Weight</li> <li>- Mass</li> <li>- Newton meter</li> </ul>	<p><b>What Is Gravity?</b> Use your ASPIRE PowerPoint to reinforce the idea that gravity pulls objects towards the Earth; therefore, unsupported objects will fall to the ground.</p> <p>Can the children explain the effect of gravity on unsupported objects?</p> <p><b>Gravity:</b> Use your ASPIRE PowerPoint to reinforce that gravity is a non-contact force.</p> <p><b>Weight or Mass?</b> Use your ASPIRE PowerPoint to explain the difference between weight and mass.</p> <p><b>ENSURE YOU IDENTIFY THE COMMON MISCONCEPTION BEING WEIGHT AND MASS.</b></p> <p>What are scales used for? What are newton-meters used for?</p>	<ul style="list-style-type: none"> <li>• Add to learning map</li> <li>• Retrieval practice</li> </ul> <p><b>Resources:</b></p> <ul style="list-style-type: none"> <li>- Newton meter (Science cupboard)</li> <li>- Weighing scales (Maths cupboard)</li> <li>- Bags with handles</li> <li>- Objects to be measured</li> </ul> <p><b>Task:</b> Children to identify different objects around the room. They should add these items to a table and record the weight and mass of each item. Children should draw three different columns in their book to complete this task.</p> <p>In addition to the above task, you may wish to take some pictures of this activity to show evidence of children working scientifically.</p> <p><b>Support:</b> Provide a template if necessary. Teacher may wish to choose the objects for a child.</p> <p><b>Challenge:</b> Explain the difference between weight and mass in your book once you have completed the task.</p>
<p><b>WEEK 3</b></p> <p>LO: I can investigate the effects of friction.</p> <p><b>Vocab:</b></p> <ul style="list-style-type: none"> <li>- Force</li> <li>- Friction</li> </ul>	<p><a href="https://www.bbc.co.uk/teach/class-clips-video/articles/zbncdnb">https://www.bbc.co.uk/teach/class-clips-video/articles/zbncdnb</a></p> <p><b>Friction:</b> Use your ASPIRE PowerPoint to explain that friction is a force that occurs when objects move across one another and that it generates heat. This could be demonstrated by having the children rub their hands together.</p>	<ul style="list-style-type: none"> <li>• Add to learning map</li> <li>• Retrieval practice</li> </ul> <p><b>Resources:</b></p> <ul style="list-style-type: none"> <li>- Newton meters</li> <li>- Shoes</li> <li>- Various surfaces (e.g. carpet tiles, vinyl flooring, wooden flooring, tarmac)</li> </ul> <p><b>Task:</b> This lesson, children will conduct an investigation into the effects of friction</p>

	<p>Can the children explain the effects of friction on a moving object?</p> <p><b>Helpful or Unhelpful?</b></p> <p>Use your ASPIRE PowerPoint to explain that friction can be both a helpful and unhelpful force.</p> <p>Can the children identify examples of when friction can be a helpful or unhelpful force?</p>	<p>on different surfaces to answer the question: <i>'Which surface creates the greatest amount of friction with the sole of a shoe?'</i></p> <p><b>Support:</b></p> <p>Children are to complete the labelled bar chart and then use the sentence stems to discuss their conclusion with a partner. This could be recorded digitally.</p> <p><b>Challenge:</b></p> <p>Children are to complete the unlabelled bar chart and then write a conclusion based on the investigation.</p>
<p><b>WEEK 4</b></p> <p><b>LO: I can explore the effects of air resistance.</b></p> <p><b>Vocab:</b></p> <ul style="list-style-type: none"> <li>- Air resistance</li> <li>- Force</li> <li>- Gravity</li> <li>- Friction</li> <li>- Parachute</li> <li>- Measure</li> <li>- Results</li> <li>- Opposing</li> <li>- Mass</li> <li>- Prediction</li> <li>- Investigation</li> <li>- Observe</li> <li>- Variables</li> </ul>	<p><a href="https://explorify.uk/en/activities/whats-going-on/soft-landing">https://explorify.uk/en/activities/whats-going-on/soft-landing</a></p> <p><b>Falling:</b></p> <p>Use your ASPIRE PowerPoint to explain that all objects fall at the same speed, regardless of mass, unless air resistance slows them down.</p> <p><b>Air Resistance:</b></p> <p>Use your ASPIRE PowerPoint to explain that air resistance is a form of friction.</p> <p><b>Helpful or Unhelpful:</b></p> <p>Use your ASPIRE PowerPoint to explore examples of where air resistance can be either a helpful or unhelpful force.</p> <p>Can the children explain how air resistance affects moving objects?</p> <p><b>Air Resistance in Nature and Technology:</b></p> <p>Use your ASPIRE PowerPoint and the Fascinating Force eBook to explore the ways in which air resistance features in nature and technology.</p> <p>Ensure that children are aware of the three types of variables and their definitions.</p>	<ul style="list-style-type: none"> <li>• Add to learning map</li> <li>• Retrieval practice</li> </ul> <p><b>Resources:</b></p> <ul style="list-style-type: none"> <li>- Materials for parachutes, such as paper, card and plastic sheets (e.g. bin bags or plastic bags)</li> <li>- Objects to attach to the parachutes, such as paperclips, toy figures and modelling clay</li> <li>- String</li> <li>- Sticky tape</li> <li>- Scissors</li> <li>- Measuring sticks</li> <li>- Stopwatches</li> </ul> <p>For this lesson, the children will carry out an investigation into the effects of air resistance.</p> <p>They will carry out an experiment to see if the type of parachute has an impact on the time it takes for it to hit the ground.</p> <p>Ensure that there is emphasis on this investigation being a 'fair test'. For example, ensure that all parachutes are being dropped from the same height. Children need to make predictions prior to completing the investigation. At the end, they should state whether or not their predictions were correct.</p> <p><b>Support:</b></p> <p>Provide children with a template to record their answers.</p>

	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px; width: 45%;">Independent Variable</div> <div style="border: 1px solid black; padding: 2px; width: 45%;">the variable being measured</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; width: 45%;">Dependent Variable</div> <div style="border: 1px solid black; padding: 2px; width: 45%;">variables staying the same</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; width: 45%;">Control Variable</div> <div style="border: 1px solid black; padding: 2px; width: 45%;">the variable being changed</div> </div>	<p><b>Challenge:</b> Why is it important to keep the variables the same?</p>
<p><b>WEEK 5</b></p> <p><b>LO: I can identify the effects of water resistance.</b></p> <p><b>Vocab:</b></p> <ul style="list-style-type: none"> <li>- Force</li> <li>- Water resistance</li> <li>- Friction</li> <li>- Streamlined</li> <li>- Opposing</li> </ul>	<p><b>Water Resistance:</b> Use your ASPIRE PowerPoint to explain that water resistance is a type of friction and that it, like other forces, can be both helpful and unhelpful.</p> <p><b>Shape and Water Resistance:</b> Use your ASPIRE PowerPoint to explain the investigation.</p>	<div style="background-color: #add8e6; padding: 5px;"> <ul style="list-style-type: none"> <li>• Add to learning map</li> <li>• Retrieval practice</li> </ul> </div> <div style="background-color: #ffff00; padding: 5px; margin-top: 10px;"> <p><b>Resources:</b></p> <ul style="list-style-type: none"> <li>- Modelling clay</li> <li>- Three identical measuring cylinders per group</li> <li>- Water</li> <li>- Junk modelling materials</li> <li>- Large water tray (Reception's Garden)</li> <li>- Battery-powered handheld fan</li> <li>- Stopwatch</li> </ul> </div> <p><b>Task:</b> Children complete the boat race challenge. Provide children with the junk modelling equipment so they can make their boats, then time how long it takes each boat to cross the water tray.</p> <p>Prior to the race, children should make a prediction in their books with how well they think their boat will move through the water.</p> <div style="background-color: #ff8c00; padding: 5px; margin-top: 10px;"> <p><b>Support:</b> Provide a template and sentence stems if necessary. Place children in mixed-ability groups.</p> </div> <div style="background-color: #e6e6fa; padding: 5px; margin-top: 10px;"> <p><b>Challenge:</b> Link to previous learning. Which variable are you changing and why?</p> </div>
<p><b>WEEK 6</b></p> <p><b>LO: I can explore and design mechanisms.</b></p>	<p><a href="https://www.youtube.com/watch?v=LiBcur1aqcg">https://www.youtube.com/watch?v=LiBcur1aqcg</a></p> <p><a href="https://explorify.uk/en/activities/odd-one-out/levers-in-action">https://explorify.uk/en/activities/odd-one-out/levers-in-action</a></p>	<div style="background-color: #add8e6; padding: 5px;"> <ul style="list-style-type: none"> <li>• Add to learning map</li> <li>• Retrieval practice</li> </ul> </div> <div style="background-color: #ffff00; padding: 5px; margin-top: 10px;"> <p><b>Resources:</b> Items involving levers, pulleys and gears to tinker with.</p> </div>

**Vocab:**

- *Force*
- *Mechanism.*
- *Lever*
- *Pulley*
- *Gear*

**Mechanisms:**

Use your ASPIRE PowerPoint to display images of levers, pulleys and gears in order to identify any prior knowledge.

**What Do Mechanisms Do?**

Use your ASPIRE PowerPoint to explain that mechanisms allow a small amount of force to have a greater effect.

**Tinkering**

Give pupils the opportunity to tinker with items that involve each type of mechanism, in order to explore how they work. Some examples may include: clocks, tweezers and window blinds.

**Spot the Mechanism:**

Use your ASPIRE PowerPoint to show images of objects that use the different mechanisms. Can the children identify the type of mechanism being used in each example?

**Task:**

Pupils are to design a machine for a specific purpose, incorporating various mechanisms and explain how they work.

**Support:**

Teacher may wish to give children a specific item to design.

**Challenge:**

Evaluate someone else's design. Would it work? Could it be improved?

Knowledge Organiser for the unit:

# The ASPIRE Curriculum-Key Learning

Title: Forces

Subject: Science

Year: 5



Key Knowledge	Key Skills	Key Vocabulary
<p><b>Forces</b></p> <p>A force is a push or pull that <b>acts upon an object</b>. We can't see forces, but they are an important part of our everyday lives. We <b>push and pull</b> objects to do many different things. When we push or pull objects we can <b>move the object, change the shape of the object or make the object change direction</b>.</p> <p><b>Friction</b></p> <p>Friction is a force created between two surfaces when they rub together. Friction creates heat and always slows down an object. Rough surfaces create more friction than smooth surfaces.</p> <p><b>Air Resistance</b></p> <p>Air resistance is a force that acts in the opposite direction to gravity. It acts between a moving object and the air molecules around it, slowing the object down. Air resistance is a type of friction. Parachutes are used to increase air resistance and slow down the parachutist, so they can land safely. Modern cars and planes are <b>streamlined in design</b> to reduce air resistance, allowing them to move faster.</p> <p><b>Gravity</b></p> <p>Gravity is a force which acts at a distance. It is a pull force that pulls objects towards the centre of the Earth.</p> <p>The planets and the Sun do not touch, yet the planets stay in orbit around the Sun due to the force of gravity.</p> <p><b>Examples of push and pull</b></p> <p>Push Pull</p> <p><b>Water Resistance</b></p> <p>Water resistance is the force responsible for making it difficult for us to move through the water. It acts between a moving object and the water molecules around it, slowing the object down.</p> <p><b>Did you know?</b></p> <p>Sir Isaac Newton was a scientist who developed the first description of the force of gravity. Newton said that he started thinking about gravity after watching an apple fall from a tree but it did not actually hit him on the head, as it is often claimed!</p>	<ul style="list-style-type: none"> <li>- To identify the effects of air resistance, water resistance and friction.</li> <li>- To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</li> <li>- To identify the effects of friction that act between moving surfaces and are beginning to explain these effects.</li> <li>- To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</li> <li>- To record data and results of increasing complexity using scientific diagrams.</li> <li>- To plan different types of scientific enquiry to answer questions, recognising and controlling variables where necessary.</li> <li>- To take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.</li> <li>- To report and present 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.</li> </ul>	<p><b>Force:</b> A force is a push or pull that can cause an object to start or stop moving or change its speed, direction or shape.</p> <p><b>Gravity:</b> Gravity is a pulling force exerted by the Earth (or any object with mass).</p> <p><b>Newton (N):</b> The newton (N) is a unit of measurement used to measure force, named after Sir Isaac Newton.</p> <p><b>Friction:</b> Friction is a contact force that occurs between two touching surfaces that are either trying to move or are already moving across each other.</p> <p><b>Air resistance:</b> Air resistance is a form of friction that occurs between air and an object moving through it. It can also be referred to as 'drag'.</p> <p><b>Water resistance:</b> Water resistance is a type of friction that happens when water (or any liquid) pushes against an object moving through it.</p> <p><b>Streamlined:</b> Streamlined objects have a shape that allows them to move more efficiently through air or water by reducing resistance.</p> <p><b>Mechanism:</b> A mechanism is the smaller moving parts of a machine.</p> <p><b>Lever:</b> A lever is a mechanism that uses a small force to move a heavier load by pivoting on a fixed point.</p> <p><b>Pulley:</b> A pulley is a wheel (or set of wheels) over which a rope is looped, used to lift heavy objects with less effort.</p> <p><b>Gear:</b> Gears are wheels with teeth that lock together and turn each other to transfer motion.</p>






Luke 1:37 "For with GOD nothing shall be impossible"

#ASPIRE

## Scientific Enquiry/Skills for the unit:

### Types of Scientific Enquiry, Skills Coverage

This table details the opportunities for developing scientific enquiry skills throughout the unit. **The ones in italic text are not detailed in the lessons but give suggestions of how the lesson content could be used to form a scientific enquiry.**

Year Group	5	Topic	Forces
	Observing over Time	<i>Not relevant for this unit.</i>	
	Pattern Seeking	<b>Notice links between the weight and mass of an object. (Lesson 2)</b> <i>Conduct tests and notice links between the properties of a material and how much friction is created. (Lesson 5)</i>	
	Identifying, Grouping and Classifying	<i>Complete an activity or think about what you do during an everyday task. Identify the forces that are being used. Which force is being used the most/least? (Lesson 1)</i> <b>Identify if an object has a lever, gear or pulley. (Lesson 6)</b>	
	Comparative and Fair Testing	<b>Complete a fair test to investigate if there is a link between the weight and mass of an object. (Lesson 2)</b> <b>Carry out a test to investigate which parachute would take the longest time to fall to the ground. (Lesson 3)</b> <i>Make rockets with different-shaped noses to compare the effect of air resistance and how far the rockets will travel. (Lesson 3)</i> <b>Carry out a comparative test investigating how the shape of a boat has an impact on how much water resistance is created, affecting the speed of the boat. (Lesson 4)</b> <i>Complete a comparative test comparing how different shapes of modelling clay fall through water and other types of liquid. (Lesson 4)</i> <b>Carry out a comparative test to find out which material would make the most effective brake pads for a tricycle or scooter. (Lesson 5)</b> <i>Carry out a comparative test to investigate friction by making a balloon rocket and using different materials inside the tube to see how the material affects the speed the rocket takes to get to the other side of the string. (Lesson 5)</i>	
	Researching	Use the Lesson Presentation to learn about different kinds of forces to then identify them. (Lesson 1) Read the Newton and Gravity Fact Sheet to find the answers to questions. (Lesson 2) Children complete a carousel activity, finding out about different types of mechanism by reading and making notes. (Lesson 6)	