

# Batheaston Church School

"That they may have life, life in all its fullness" John 10:10




Dream...Aspire...Achieve



## Topic Knowledge Organiser KS2 – Design it, Make it, Test it! (STEAM-Science, Technology, Engineering, Art and Maths) Elm Class – Year 3

Science – Forces and Magnets. Light and Shadow.	
<p><b>What Should I Already Know?</b> (Science knowledge from Early Years and Key Stage 1)</p> <p>Forces and Motion Stations</p> <p>marbles on a ramp <b>PUSH</b></p> <p>soda bottle bowling <b>PUSH</b></p> <p>chair pulled <b>PULL</b></p> <p>using a Venn diagram <b>PULL</b></p>	<ul style="list-style-type: none"> <li>I know that the shape of some materials can be changed when they are <b>stretched, twisted, bent</b> and <b>squashed</b>.</li> <li>I know how different toys move.</li> <li>I know what a force is and be able to explain that a push and pull are types of forces.</li> <li>I know that when forces are applied to an object they allow them to move or stop moving.</li> <li>I know that the strength of the force determines how far and fast an object moves</li> <li>I know that certain things produce light, usually by burning (e.g. the Sun) or electricity (e.g. street lights)</li> <li>I know that shiny materials do not make light but do reflect it.</li> <li>I know that shadows are caused when certain materials block light.</li> </ul>
Key Vocabulary	
Attract	If one object <b>attracts</b> another object, it causes the second object to move towards it
Bendy	An object that bends easily into a curved shape
Friction	The <b>resistance</b> of <b>motion</b> when there is contact between two <b>surfaces</b>
Force	The <b>pulling</b> or <b>pushing</b> effect that something has on something else
Gravity	The <b>force</b> which causes things to drop to the ground
Drag	The backwards <b>motion</b> caused by <b>resistance</b>
Lift	The upwards <b>motion</b> of an object
Thrust	The forward <b>motion</b> of an object
Magnet	A piece of iron or other material which attracts <b>magnetic</b> materials towards it
Magnetic field	An area around a magnet, or something functioning as a magnet, in which the magnet's power to attract things is felt
Metal	A hard substance such as iron, steel, gold, or lead
Motion	The activity of changing position or moving from one place to another
Non-magnetic	An object that is not magnetic
Opposite	Things of the same kind which are completely different in a particular way. For example, north and south are opposite directions
Position	The place where a person or place is in relation to other things
Pull	When you pull something, you hold it firmly and use force in order to move it towards you or away from its previous position
Push	When you push something, you use force to make it move away from you or away from its previous position
Resistance	A force which slows down a moving object or vehicle
Squash	To press or crush with such force that something loses its shape
Stretchy	Slightly elastic
Surface	The flat top part of something or the outside of it
Twist	Turn something to make a spiral shape
Angle	The direction from which you look at something
Dark	The absence of light
Light	A brightness that lets you see things

Opaque	If an object or substance is opaque, you cannot see through it
Reflect	Sent back from the surface and not pass through it
Shadow	A dark shape on a surface that is made when something stands between a light and the surface
Source	Where something comes from
Translucent	If a material is translucent, some light can pass through it
Transparent	If an object or substance is transparent, you can see through it

What will we investigate?	Key Questions/Lesson Focus
<ul style="list-style-type: none"> <li>Investigate the amount of friction created by different surfaces.</li> <li>Use measures (such as length and time) to show how far or fast and object travels.</li> <li>Explore different forces</li> <li>Investigate how magnets are used in everyday life.</li> <li>Investigate which materials are magnetic and sort between objects that are magnetic and those that are non-magnetic.</li> <li>Investigate if the size of a magnet affects how strong it is (using chains of paper clips of varying lengths)</li> <li>Investigate if all metals are magnetic.</li> <li>Observe what happens when magnets with similar poles are placed next to each. Repeat this for when the poles are different.</li> <li>What would make it a fair test?</li> <li>Explore which objects form shadows when light is shone on them.</li> <li>How can you change the size and shape of shadows by using the same object?</li> <li>Investigate the colour in light using prisms.</li> <li>Investigate which material is the best for shielding our eyes from the sun.</li> </ul> 	<ul style="list-style-type: none"> <li>How can you make it start to move?</li> <li>How well can an object slide on different materials?</li> <li>How do things slow down?</li> <li>How fast can you go?</li> <li>What is making it move?</li> <li>Which materials are magnetic?</li> <li>What can magnets do?</li> <li>How strong are the magnets?</li> <li>How do magnets affect each other?</li> <li>What colour is light?</li> <li>How can we make things easier to see at night?</li> <li>How can I make a shadow?</li> <li>How can I change the size of a shadow?</li> <li>What makes the best sunglasses?</li> <li>Are you safe in the sun?</li> </ul>  

What I will know by the end of the topic?	
<ul style="list-style-type: none"> <li>Forces are pushes and pulls.</li> <li>These forces change the motion of an object.</li> <li>They will make it start to move or speed up, slow it down or even make it stop.</li> <li>Forces act in opposite directions to each other.</li> <li>When an object moves across a surface, friction acts as an opposite force.</li> <li>Friction is a force that holds back the motion of an object.</li> <li>Some surfaces create more friction than others which means that objects move across them slower.</li> <li>On a ramp, the force that causes the object to move downwards is gravity.</li> </ul>	<ul style="list-style-type: none"> <li>Magnets produce an area of force around them called a magnetic field.</li> <li>When objects enter this magnetic field, they will be attracted to or repelled from the magnet if they are magnetic.</li> <li>When magnets repel, they push each other away.</li> <li>When magnets attract, they pull together.</li> <li>Objects that are magnetic, are attracted to magnets.</li> <li>Iron and steel are magnetic.</li> <li>Aluminum and copper are non-magnetic.</li> <li>The ends of a magnet are called poles.</li> <li>One end is called the north pole and the other end is called the south pole.</li> <li>Opposite poles attract, similar poles repel.</li> </ul>

- Objects move differently depending on the surface of the object itself and the surface of the ramp.



- If you place two magnets so the south pole of one faces the north pole of the other, the magnets will move towards each other. This is called attraction.
- If you place the magnets so that two of the same poles face each other, the magnets will move away from each other. They are repelling each other.
- We must never look directly at the Sun as the light produced is very bright and can be harmful to our eyes. This is why we wear sunglasses.
- When light is blocked by an opaque object, a dark shadow is formed.

## Design and Technology

### What Should I Already Know?



- I can fix an axle to a chassis and attach wheels.
- I can construct a simple pulley using roll over a horizontal bar to raise an object off the ground.
- I can use construction kits with gears to construct a line of gears that turn.
- I can construct cubes of different sizes from a net.
- I can select materials and components according to known characteristics and functions.
- I can select and use an increasing range of tools to cut, shape and join materials and components.
- I can use a ruler to measure and mark lines for cutting.
- Make simple paper models, mock-ups and templates.
- Select an appropriate way to improve the appearance of a product.
- Follow procedures for safety and hygiene.

### Key Vocabulary

Research	Investigation into facts.
Function	The activity of a person or thing.
Design	A plan or drawing of a new product.
Plan	A detailed proposal for achieving something.
Materials	What something is made of.
Components	A part of a whole thing.
Tools	A thing used to carry out a function.
Mock ups	A model of a product.
Appearance	The way something looks.
Product	The resulting object.
Similarities	Things which are the same.
Differences	Things which are different.
Evaluate	Test how well something works.
Axle	A rod passing through the centre of a wheel.
Pulley	A wheel with a rope through it.
Chassis	The base frame of a wheeled vehicle.
Gears	A toothed wheel.
Circuit	An electrical path.
Net	A pattern which can be folded to make a 3D shape.
Joints	The point at which two parts are joined.

### What will we design?

- Create zip wires using pulleys and levers.
- Use axles to create balloon buggies.
- Create magnetic games.

### Key Questions/Lesson Focus

- How fast can you move a load?
- Can wind power make a vehicle move?
- How can I stay safe on my bike in the dark?

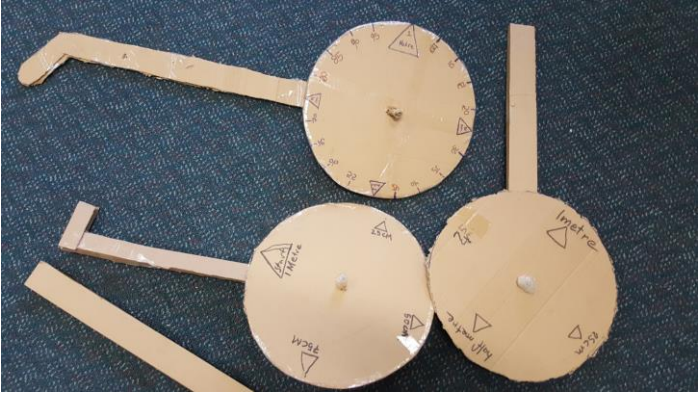
- Use electrical circuits.
- Design ways of staying safe in the dark.
- Make a distance measurer.
- Investigate and design a sundial.
- Design a gadget to impact climate change.
- Make a musical instrument.

- How do I measure distance?
- How can shadows tell time?
- How could I slow down climate change?

**What I will know by the end of the topic?**

I will be able to:

- Construct a pulley that allows a load to travel horizontally along a rope.
- Use construction kits with gears to mesh gears at right angles.
- Construct a range of sliders and levers.
- Vary the position of the pivot point to lift a load using a lever.
- Identify the cam within a simple mechanism and explain how movement is changed.
- Explore and describe how an electric motor can be used in a circuit.
- Use knowledge of similarities and differences between products to find most effective product.
- Select the most effective finish to enhance the appearance
- Select and use tools and equipment to measure, mark out and shape materials and components.
- Insert paper fasteners for card linkages.
- Investigate and begin to analyse a range of existing products.
- Use research to develop design criteria that are fit for purpose.
- Make increasingly complex paper models, mock-ups and templates.
- Evaluate ideas and products against own design criteria, taking into account the views of others.



**Art - Drawing**

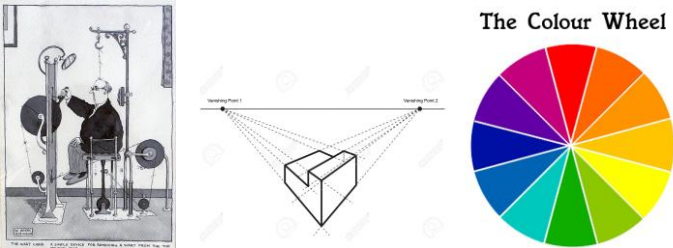
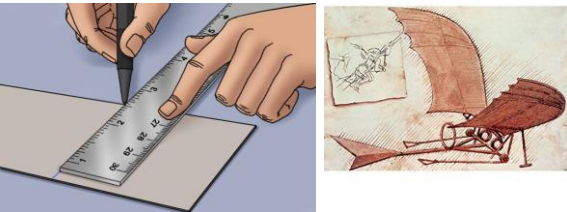

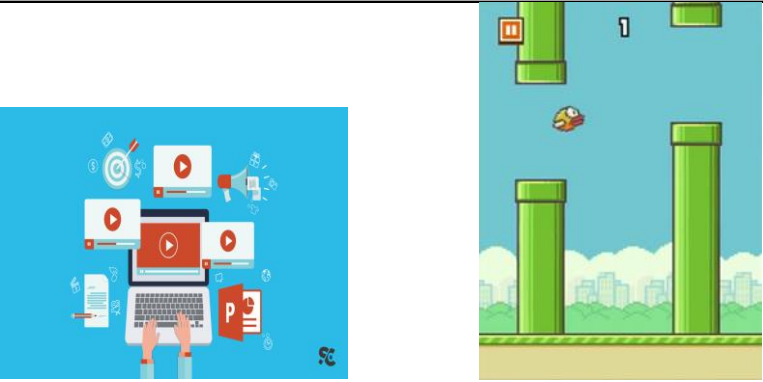
**What Should I Already Know?**



- Talk about the drawing tools and techniques used to share ideas.
- Use a wide range of different lines, e.g. thin, bold, feint, wavy, broken etc.
- Create simple drawings based on things observed in order to create designs.
- Use a viewfinder to select and record shapes and images.

**Key Vocabulary**

Visual	Something we can see.
Tactile	Something we can touch or feel like we can touch.
Perspective	The appearance of things relative to each other.
Viewfinder	A device for isolating or cropping a scene or picture.
Image	A photograph or picture.

Figure	A depiction of a human body.
Observations	Drawing from real life.
<b>What will we do?</b>	<b>Key Questions/Lesson Focus</b>
<ul style="list-style-type: none"> <li>Investigate and imitate the work of Heath Robinson (with Paolo).</li> <li>Investigate and create colour wheels</li> <li>Create sketches and continue to work on perspective in sketch books adding notes and observations.</li> <li>Discuss the work of Heath Robinson</li> <li>Use a viewfinder.</li> <li>Draw simple figures.</li> <li>Draw technically in the style of Heath Robinson.</li> </ul>	<ul style="list-style-type: none"> <li>Who was Heath Robinson and what was his art like?</li> <li>How does colour create white light?</li> <li>What is a colour wheel?</li> <li>How can I create 3D drawings?</li> <li>How can I make sure my drawings are to scale and the sizing is correct?</li> </ul> 
<b>What I will know by the end of the topic?</b>	
I will be able to: <ul style="list-style-type: none"> <li>Draw using a vanishing point.</li> <li>Use rulers to measure and create straight lines in my art.</li> <li>Mix a variety of secondary colours.</li> <li>Identify and discuss the work of Heath Robinson and design work of Leonardo Da Vinci.</li> </ul>	
<b>ICT – Presentation, Network Engineering</b>	
<b>What Should I Already Know?</b>	
	<ul style="list-style-type: none"> <li>Debug' simple programs.</li> <li>Work with various forms of output.</li> <li>Use the Internet effectively, including search technologies.</li> <li>Collect information and present it to someone else.</li> <li>Use technology to organise and manipulate digital content.</li> </ul>
<b>Key Vocabulary</b>	
PowerPoint	Software to create slides showing information for presentations.
Software	Programs and information used by a computer.
Network	A group of interconnected computers.
Online	Connected to a computer.
Algorithm	A set of rules to be followed by a computer
Trigger	Initiates the computer to act
Input	Data entered into the computer
<b>What I will know by the end of the topic?</b>	
<ul style="list-style-type: none"> <li>To present information effectively using PowerPoint and Green Screen.</li> <li>To research and record information in my own words.</li> <li>How to create an algorithm.</li> <li>How to use an input to trigger an algorithm.</li> <li>How to design my own game</li> </ul>	

Other subject links within this topic	
English	Writing explanation texts linked to science – forces. Scientific recording and writing. Instruction writing linked to magnetic games.
Maths	Measuring – linked to creating trundle wheels and technical drawing in art. Time – creating a sundial. Scaling up and down for design mock ups. Statistics – racing zip wires.
PE	Use of balls – discussion of forces used pushes and pulls to reinforce science work.
History	Continuing to look at influential people through history linking back to last term – Leonardo Da Vinci, Heath Robinson, Einstein, range of scientists and inventors.
Geography	Linked with science work on climate change.