Design and Technology Curriculum

Year 1 – Year 6

ST LUKE'S

CHURCH SCHOOL

Design Technology Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
EYFS (Expressive Arts)	Junk Modelling		Bookmarks		Design & Make A Rainbow Salad	
Year 1	Eat More Fruits and Vegetables		Stable Structures			Moving Mini Beasts
Year 2	Puppets		Vehicles			Perfect Pizzas
Year 3		Story books		Pencil Cases	Making Mini Greenhouses	
Year 4		Seasonal Stockings		Torches		Seasonal Food
Year 5	Building Bridges		Fashion and textiles (bags)		Chinese Inventions	
Year 6	Programming Pioneers		Birdhouse Builders			Burgers

Cookery Textiles Structures Electronics Mechanisms

The Aims of the National Curriculum for Design and Technology

- develop the creative, technical and practical expertise needed to perform everyday tasks confidently and to participate successfully in an increasingly technological world
- build and apply a repertoire of knowledge, understanding and skills in order to design and make high-quality prototypes and products for a wide range of users
- critique, evaluate and test their ideas and products and the work of others
- understand and apply the principles of nutrition and learn how to cook.

Intent

Through high-quality design and technology teaching, our pupils will acquire a broad range of subject knowledge, which is developed each year from Reception through to Year 6. Our pupils will be inspired to use their creativity and imagination to design, make and evaluate within a variety of contexts. Through disciplines such as mathematics, science, engineering, computing and art, our pupils will solve real and relevant problems whilst taking risks and being resourceful. Our innovative projects will ensure that our pupils become citizens capable of contributing to the creativity, culture, wealth and well-being of the nation, whilst displaying a critical understanding of design and technology through history to the present day.

Implementation

The St.Luke's Design and Technology curriculum is based on the planning provided by Plan Bee. We have taken the planning to form the basis of a curriculum which has been uniquely developed for us. Each year our pupils will refine the necessary skills to become capable citizens in design and technology, carefully developing these skills each year as they progress through school. In order to develop a critical understanding of the history of the subject, our curriculum has incorporated the teaching of some of the world's most influential people, as well as including some individuals from closer to home.

Reception

For further information about the knowledge content taught in Reception please refer to the separate EYFS curriculum document.

Year 1

<table>
<tr><td>Autumn 1</td><td>Focus of Study: Food: Eat More Fruits and Vegetables</td></tr>
<tr><td>NC Objectives</td><td>Key Knowledge and Vocabulary</td></tr>
<tr><td>
Designing
• design purposeful, functional, appealing products for themselves and other users based on design criteria
• communicate these ideas through talk

Making
• select from and use a range of tools and equipment to perform practical tasks safely (cut, grate and peel)
• select from a range of fruit and vegetables according to their characteristics

Evaluating
• verbally evaluate their ideas and products against design criteria.

Technical knowledge and understanding
• understand where a range of fruit and vegetables come from
• Understand and use basic principles of a healthy and varied diet
• Know and use technical vocabulary
• Know some basic concepts of health and safety when preparing foods
</td><td>
Context for study:

This unit follows on from learning in Reception where children will have experience of naming some common fruit and vegetables. They will have taken part in sensory activities to discuss appearance, taste and smell.

This unit is the precursor to work studies in Year 2 where children will develop their understanding of where foods come from, design individually using a design criteria and identify their own ingredients and equipment.

Knowledge Content:

To use the basic principles of a healthy and varied diet to prepare a fruit salad.
To know where some foods come from.
To design as a whole class using a criteria.
To develop skills to be able to cut, grate and peel.

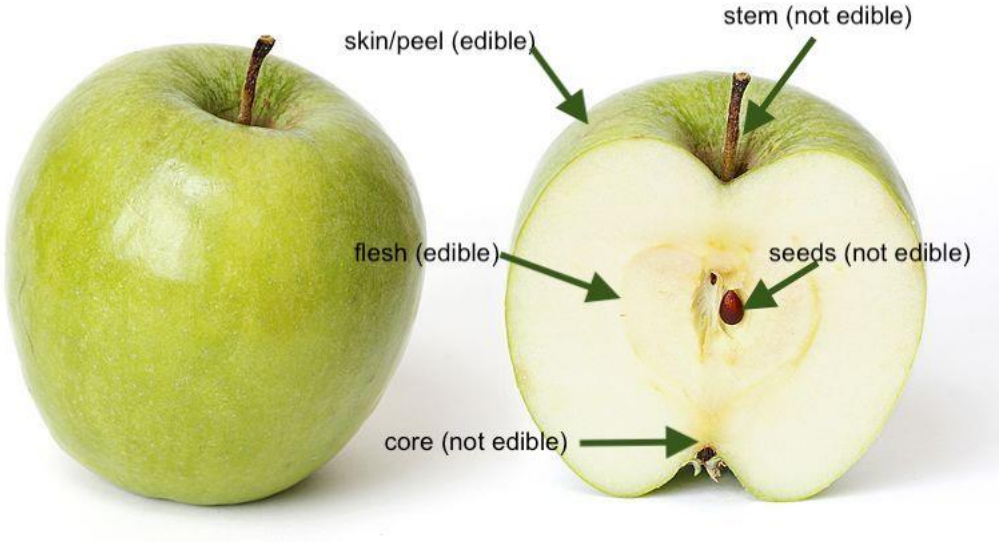
Technical knowledge

To know where these fruits and vegetables are grown:

<table>
<tr><td>Fruit/ Vegetable</td><td>Where does it grow?</td></tr>
<tr><td>orange, banana and apple
(Use the crab apples/ Malus sylvestris at the front of school as an example)</td><td>tree</td></tr>
</table>
</td></tr>
</table>

blackberries and raspberries	shrubs
grapes and tomatoes	vines
carrots, turnips and potatoes	underground
Lettuce, cucumber and peppers	above the ground
wheat and corn	grains that come from plants

To know the parts of apples and which parts we eat



To know that we must have a balanced diet and that fruit and vegetables are part of a food group.

To know as part of a healthy diet we need to eat at least 5 portions of fruit and vegetables a day.

	There are five groups of food. 1. Fruit and vegetables such as apples, tomatoes, peas and carrots. 2. Carbohydrates such as bread, rice, pasta and potatoes. 3. Proteins such as meat, fish, eggs and beans. 4. Sugars and fats such as crisps and chocolate. 5. Dairy such as cheese, milk and yoghurt. The 'Eatwell Plate' shows us how much of each of the food groups we should consume. We need to eat foods from all five groups in order to have a balanced diet. As part of a healthy diet we need to eat a variety of fruits and vegetables 5 times a day.  Evaluating products: 1. To verbally evaluate different fruits based on their description, taste and smell.

Describe the shape, colour, feel and taste of the following fruits through talking and drawing:

Fruit	Description	Taste
Raspberries		
Kiwi		
Lemon		
Watermelon		
Grapes		

Vocabulary (Know and understand the meaning of these words and how to use them).
Taste: bitter, tangy, sweet, tasty and sour.
Description: juicy, furry, smooth, rough, bumpy and hard.

Designing:

1. To decide what to include in the fruit salad.

Using the taste test, pupils will choose items to include in their fruit salad from this list: Raspberries, kiwi, lemon, watermelon, grapes, apple, banana and orange.

Making:

1. To know basic food hygiene practises (see health and safety below).
2. To know how to use simple utensils and equipment: cut, grate and peel.
   Demonstrate how to use the utensils and allow the children ample time to practise the food-processing skills. Carrots could be used to practise grating, although these will not be used in the final product.
3. To know how to prepare a fruit salad.
   Once the fruits have been chosen by the pupils and given out, they must know how to cut and peel the fruits into small pieces independently.

	Health and Safety: The pupils must be taught to work safely and hygienically. Identify whether there are children who are not permitted to taste or handle any food ingredients or products. • Aprons must be worn to protect clothes and to stop the spread of bacteria. • Hands must be washed before handling food and kept clean throughout the handling process. • Equipment must be kept clean and tidy (no spoon of knife licking). • Long hair must be tied back. • Surfaces must be kept clean and tidy. • Do not cough or sneeze over food preparation areas. • Cuts and grazes must be covered up with a plaster or dressing. Other tips: For children who are struggling to cut/slice/grate, use a fork to hold the fruit in place. Resources needed: A range of fresh fruit/ vegetables. Chopping boards, knives, peelers, spoons, jugs, plates, bowls, aprons, plastic table covers, hand washing and washing- up facilities. Outcome: To know where some fruits and vegetables grow. To prepare a fruit salad.

Spring 1	Focus of Study: Structures: Stable Structures
NC Objectives	Key Knowledge and Vocabulary
Designing • design purposeful and appealing products for themselves and other users based on design criteria *Making* • select from and use a range of tools and equipment to perform practical tasks safely (cutting and joining) • select from a range of materials, including construction materials. *Evaluating* • evaluate a range of existing products • evaluate their own products against design criteria *Technical knowledge and understanding* • build structures, exploring how they can be made stronger, stiffer and more stable	Context for study: This unit is the precursor to learning in Year 3, where the children will make a free-standing structure of a mini greenhouse. Their knowledge of structures will be further developed in Year 5 through a unit of learning on designing/making bridges. Knowledge Content: To evaluate existing products. To design as a whole class using a criteria. To identify appropriate materials to make a structure more stable. To use joins effectively to attach and strengthen. Technical knowledge We use free standing structures for lots of different things. This could be as large as a carpark or house, or as small as a pet house. A stable object or structure is one that isn't likely to fall over. Use the following images to explain the purposes of some of the structures. Can the children think of any of their own examples?   

	Why are some structures raised off the ground on legs? Some houses are raised off the ground to ensure that they do not flood. In hotter countries they are raised off the ground to allow better ventilation and to keep them cool. It also protects the houses from pests like insects and rats. Some structural designs are raised off the ground to allow the space underneath to be used e.g. car parking or for roaming space with pet houses.   How many materials can the children name? Have examples of the following materials: wood, rock, cardboard, rubber, fabric, plastic, glass, wool, metal, leather, sand and paper. Explain that one of the images that you looked at was of a plastic carpark. What do the children know about plastic? Explain that one of the images that you looked at was of a wooden carpark. What do the children know about wood?

Plastic characteristics:
Can be lightweight
Can have very bright colours
Can be stiff and strong e.g. used for slides
Can be flexible e.g. used for balloons
Can be broken easily and difficult to repair
Plastic takes a long time to decompose so it stays around or a very long time

Wood characteristics:
Can be heavy
Can be painted but its natural colour is brown
Is usually stiff and strong e.g. used for toys to ride on
Can be weak but repaired with glue
Is a natural material and only takes a few years to decompose

Evaluating products:

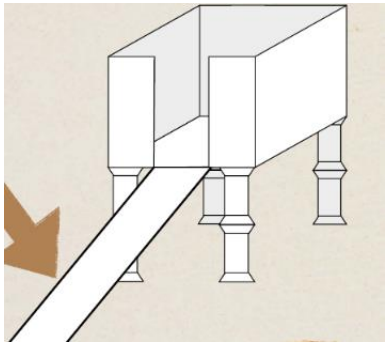
Use the above images of the toy car park and toy service station:

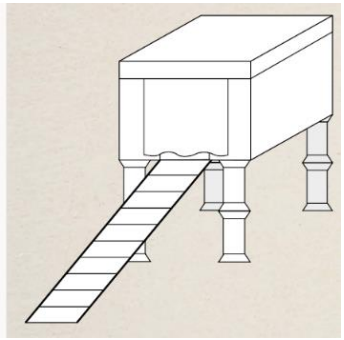
- What are they made from?
- What works well?
- What could be improved?
- What is the same/ what is different about the toy structures?

Once the children have made their structures, use the following criteria to evaluate their products:

- Does the structure stay standing?

	• Is it able to hold the weight of a small pet toy? • Does it have a safe route in and out for the pet toy? Vocabulary (Know and understand the meaning of these words and how to use them). Wood: a hard material which forms the main part of a tree. Plastic: a material that can be moulded into shape while soft and then is rigid once set. Decompose: to break down, become rotten or decay. Strong: Is able to withstand force or pressure. Weak: Is likely to break under pressure and is easily damaged. Designing: As a class, look at the plan for the stable structure. Discuss what the structure could be used for. What information can the class see from the plan? Why might the ramp need to have raised sides? Explain that the plan could be used as a car park and that the sides would stop the cars from falling off the ramps. What other possible ideas can the class come up with? Explain that in groups, they are going to make the plan of the stable structure. It will be the home for a toy pet. What details could be added to the plan to make it more suitable? Ideas could include a roof, raised steps on the ramp and a curtain for a door. We are going to make our structures using cardboard, wood and paper. What do the children know about cardboard? Which material would be best for the legs/ ramp/ sides? Why?





Model to the children how layering cardboard makes it stronger. Laying paper straws vertically on the ramp can create sides. Laying them horizontally can create steps.

Making:

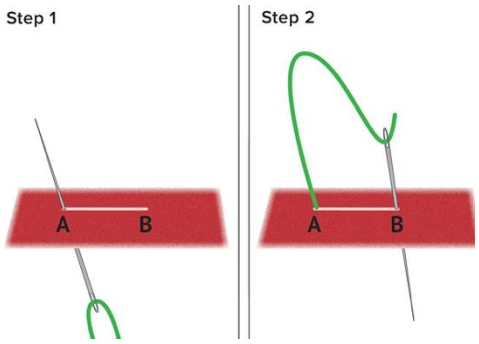
1. To identify suitable materials that can be used to create the structure (cardboard, wooden reels and fabric for the curtain).
2. To know how to make a structure more secure (glue straws and paper to the ramp to create sides and/or steps).

Health and Safety:

	The pupils must be taught to work safely. • Ensure scissors are handled and used correctly. • Children to be supervised when cutting the cardboard box for the entrance to their structure. Other tips: For children who are struggling to cut cardboard/ strips of paper, have pre-cut pieces ready to use. Some groups may require support cutting the entrance to their structure. Resources needed: Cardboard boxes (printer paper boxes would be ideal with the lids), cardboard strips for the ramp, wooden reels, paper, art straws, PVA glue and small pieces of fabric to create a curtain. Outcome: To be able to make a stable structure for a toy pet. To know how a structure can be adapted for different purposes. To be able to identify suitable materials.

Year 2

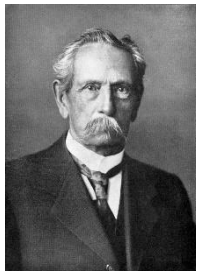
Autumn 1	Focus of Study: Textiles: Puppets
NC Objectives	Key Knowledge and Vocabulary
Making • select from and use a range of tools and equipment to perform practical tasks (running stitch to join and tie knots to finish). *Evaluating* • Explore and evaluate a range of existing products. • Evaluate their product (running stitch).	Context for study: This unit follows on from learning in Reception where pupils will have experience of threading beads and laces. The unit is a pre-curser of Textiles in Year 4, where pupils will practise cutting their own fabric templates, over stitch and simple applique. Further to this, in Year 5 the children will be creating a bag, advancing their skills to back stitch and embroidery. Knowledge Content: To join two pieces of material together to make a puppet. Technical knowledge Cotton is a fibre that people use to make cloth and other goods. Cotton grows on shrublike plants (link back to the Year 1 food topic where shrubs were discussed). Cotton grows in warm areas of the world, such as Africa and parts of Asia. From around 1760, Britain experienced a huge change known as the Industrial Revolution. Many British people went from living in small villages, to living in large cities, working in factories. In Lancashire lots of cotton mills were built. The factories turned raw cotton into material to make clothes and other things. By 1860 there were over 2000 cotton mills in Lancashire. In Oldham alone there were 400 mills, with the last of them closing in 1998.

	Children from poorer families worked in the cotton mills. They would start working as young as 7 years old and would work 13 hour days. They had very few chances to get fresh air and didn't receive an education. Because children were small they were given the job of the 'piecer.' This meant that they had to crawl under the machines whilst they were switched on and collect dropped pieces of material. This was a very dangerous job and often resulted in serious injuries and death. Making Part 1: Practise • To thread a needle and to tie a knot. (To be practised on a piece of felt until the children are confident enough to do this independently. If this task needs to be differentiated, a self-threading needle may be used). A single knot should ensure that the thread does not come through the felt. • To complete a running stitch. (The thread should be threaded from the back of the felt to ensure that the knot is on the back of the material. Practise getting the stitches of the same length and distance apart). See video if needed a the end of the unit if needed.  • To know how to finish a row of stitches with a knot. • To know what buttons are used for and items of clothing that use buttons.

	(Buttons are used to hold two pieces of material together, but so that the material can also be undone. Some items which have a button include a polo t-shirt, trousers, cardigans, cushions and bedding sets. • To fasten a button onto a piece of felt using a cross stitch. (Again knot the thread and thread through the material from the back). See video at the end of the unit if needed. Making Part 2: The puppet • To be able to thread a needle. • To attach two button eyes using a cross stitch to the front piece of felt. • To attach two pieces of material using a simple running stitch. • To knot and tie off the thread.   Evaluating products: • To verbally evaluate the running stitch: Does the stitching hold the two pieces of felt together securely? Are the stitches of an equal length and distance apart?

	Other: • Use water to help wet the ends of the thread before threading the needle. • Have thread pieces cut out prior to the lesson. • For the puppet, use a thin line of glue around the edge to hold the two pieces of felt in place whilst the children sew the two pieces together. Key Vocabulary: Needle, thread, knot, seam, fabric, running stitch. Resources needed: Needles, thread, felt, buttons and pre-cut puppet fabric. Video links: Running stitch Cross stitch to apply a button Outcome: To create a hand puppet.
Spring 1	Focus of Study: Mechanisms: Vehicle
NC Objectives	Key Knowledge and Vocabulary
Designing • design purposeful and appealing products for themselves and other users based on design criteria • generate, develop, model and communicate their ideas through talking.	Context for study: This unit is the precursor to learning in Year 3, where the children will make pop-up story books and further their knowledge of how to create moving mechanisms. The children will have already studied the 'Moving Mini Beasts' unit in Year 1, where they will have learnt how to use a sliding mechanism, lever and pivot. Knowledge Content:

Making • select from and use a range of tools and equipment to perform practical tasks safely (cutting and joining) • select from a range of materials, including construction materials. *Evaluating* • evaluate their own products against design criteria *Technical knowledge and understanding* • explore and use mechanisms (wheels, axles and chassis) in their products	To design individually using a design criteria. To identify appropriate mechanisms and how to join them in order to make a moving vehicle. To evaluate their own designs and finished vehicles. Technical knowledge What is a vehicle? A vehicle is something with wheels that transports people or objects e.g. a car, truck or cart. How many different types of vehicles can the children think of? Give examples of different vehicles e.g. an ambulance and ask what they are used for. Can a shopping trolley or babies pram be classed as a vehicle? Why? Look at different parts of a vehicle. Display an image of an ambulance. Can the children identify different parts e.g. windows, wheels, headlights and windscreen? Are there other parts which the children can identify? History of vehicles In 1885, Karl Benz invented the world's first car in Germany. It was the very first to have an built in engine that ran on gas fuel.

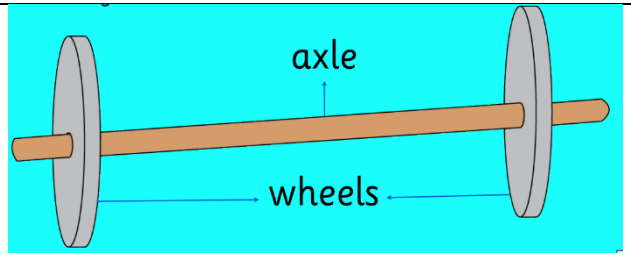


Frederick William Bremer, a plumber and gas fitter, built the first British four-wheeled petrol-engine motor car. Starting work in 1892 when he was 20, it first ran on a public highway in December 1894.

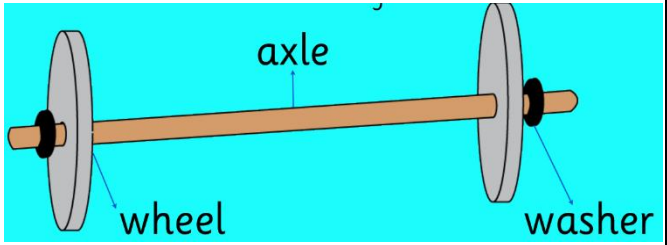
Construction of vehicles

Vehicles have wheels that make them move. Wheels are attached by axles. Axles work in two ways:

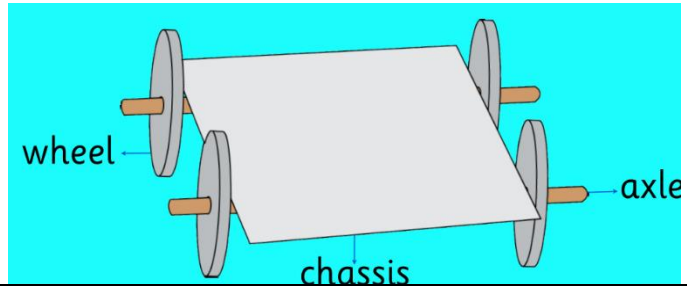
1. They can be firmly attached to the wheels so the axle rotates and the wheels turn.
2. Wheels can be placed loosely on the axle so that the wheels turn around the axle.



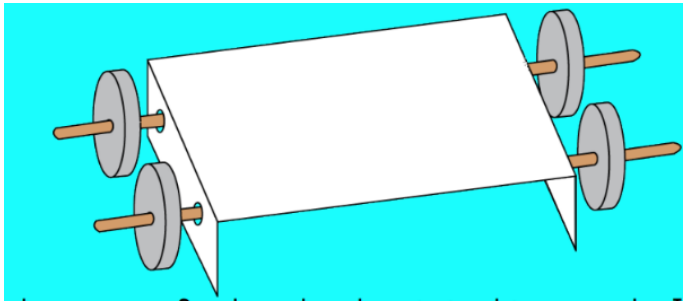
If wheels are not attached to the axles, you need something to stop the wheels from falling off. A bolt or washer can be placed on the axle to stop the wheel from coming off.



Axles are then attached to a chassis.
The chassis is the framework of the vehicle and attached the axles to the body of the vehicle. If axles are attached to the chassis from underneath, then the axle cannot turn around. The wheels are placed over the axles but not attached so that the wheels can rotate around the axle.



Axles not fixed to the chassis are put through holes in the chassis so that the axle can turn around. The wheels are firmly attached to the axle so they turn when the axle turns.



Evaluating products:

Once the children have made their structures, use the following criteria to evaluate their products:

- Which vehicles catch your eye? Why?
- How do other vehicles compare to yours?
- Do the vehicles move well?
- What was your favourite part of making the vehicle?
- What was the most difficult part about making your vehicle?

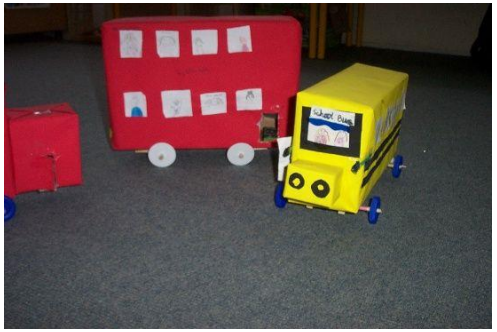
Vocabulary (Know and understand the meaning of these words and how to use them).

Vehicle: A vehicle is something with wheels that transports people or objects.
Wheels: A circular object that revolves on an axle and is fixed below a vehicle.
Axle: A rod passing through the centre of a wheel.
Chassis: The base frame of a wheeled vehicle.

Designing:

The children should be given the following criteria before planning their vehicle:

- Your vehicle must have wheels to make it move.

	• It must have axles. • Your vehicle must have a body on a chassis. The children should be able to describe the design process e.g. what they will need to do first, how they will put the wheels and axles together, how they will attach the axles to the chassis and how their vehicle will be decorated. This could be displayed as a flow chart or set of instructions. Making: 1. To know what components make a vehicle. 2. To know how to suitably attach the components to one another to be able to make a vehicle.   Health and Safety: The pupils must be taught to work safely. • Ensure scissors are handled and used correctly. • Children to be supervised when cutting.

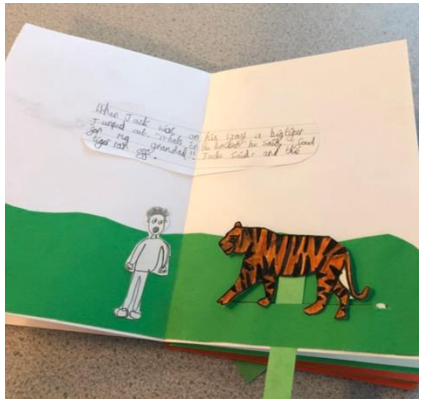
	Other tips: Children may need support creating holes in their chassis if they have chosen to secure their axles to their chassis using this technique. Resources needed: Wheels, axles, chassis (card), a selection of coloured cards to create the body of the vehicle. Outcome: To be able to create a moving vehicle. To be able to name the parts of a moving vehicle and explain how they are put together.

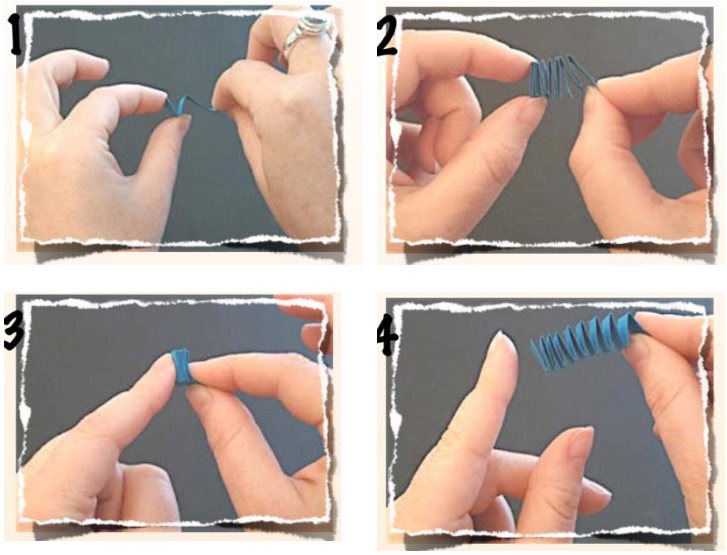
Year 3

Autumn 2	Focus of Study: Mechanisms: Story books
NC Objectives	Key Knowledge and Vocabulary
Designing • Use research and develop design to make appealing products that are fit for purpose and aimed at a particular group *Making* • select from and use a range of tools and equipment to perform practical tasks (cut, slice, pierce) • select from and use a wider range of materials and components (pivot, rotate, lever and linkage) *Evaluating* • investigate and analyse a range of existing products • evaluate their ideas and products against their own design criteria and consider views of others to improve their work *Technical knowledge and understanding* • understand and use mechanical systems in their products (pivots, rotation, levers and linkages)	Context for study: This unit follows on from two precursor units (Moving Mini Beasts Year 1 and Vehicles Year 2). It is followed by the unit titled, Chinese Inventions in Year 5 where the children will learn about important Chinese inventions and design a kite using appropriate materials. The children will have already used a sliding mechanism, wheel mechanism, lever and pivot and this will be a consolidation of those skills. They will extend their existing knowledge to include concertina, pop-up objects and window flaps. Knowledge Content: To know some techniques to create moving parts in a pop-up story book. To know that different fonts and graphics make covers look good and entice people to read the book. Technical knowledge Pivot- A pivot is a point that something turns around. The centre of a merry-go-round is a pivot. Rotate- Rotate means to turn something around an axis or centre. Clock hands rotate around the centre of the clock. Lever- A lever is a bar or rod that when pushed or pulled causes something else to move. A door handle is a lever.

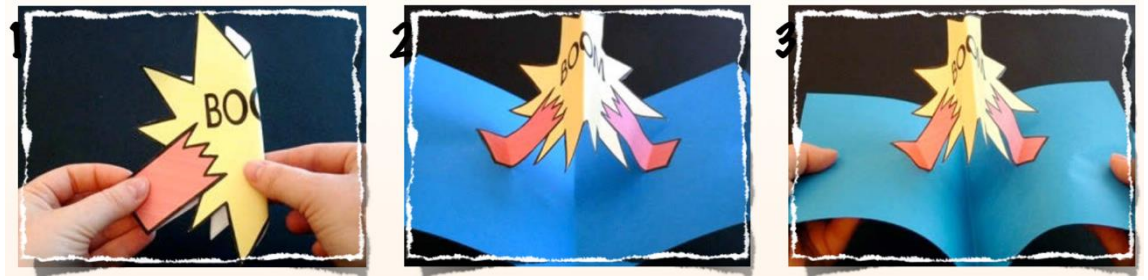
	Linkage- A linkage system is a series of bars, rods or springs that cause something else to move. A jack-in-the-box has a linkage system. Evaluate existing products: • What materials have they used for the mechanism? • Which part is moving and why? • How have they made it move? Robert Sabuda is a children's pop-up book artist and paper engineer. His recent books include retellings of stories of The Wonderful Wizard of Oz and Alice in Wonderland. His specific interest is in 3D paper engineering. He is a multiple No.1 New York Times best-selling children's book creator and has over five million books in print published in over 25 languages. 

	Evaluating products: When evaluating existing products, look at the moving mechanisms in a story book. Sketch and label the picture, then design a similar mechanism to suit a different story e.g. Little Red Riding Hood, Goldilocks or Jack and the Beanstalk. Children to peer evaluate at the end when they have a final product: • What is good about the storybook? • What do you think of the mechanisms? • Do the mechanisms fit the purpose? • Is the storybook suitable for the intended audience? • What could be made better? **Vocabulary (Know and understand the meaning of these words and how to use them).** Pivot- A pivot is a point that something turns around. The centre of a merry-go-round is a pivot. Rotate- Rotate means to turn something around an axis or centre. Clock hands rotate around the centre of the clock. Lever- A lever is a bar or rod that when pushed or pulled causes something else to move. A door handle is a lever. Linkage- A linkage system is a series of bars, rods or springs that cause something else to move. A jack-in-the-box has a linkage system. **Designing:** It is important to make sure that you match the font you use to the subject of the book. You may also use lots of different techniques to colour in fonts too e.g. stripes, cross-hatching, dots and patterns.

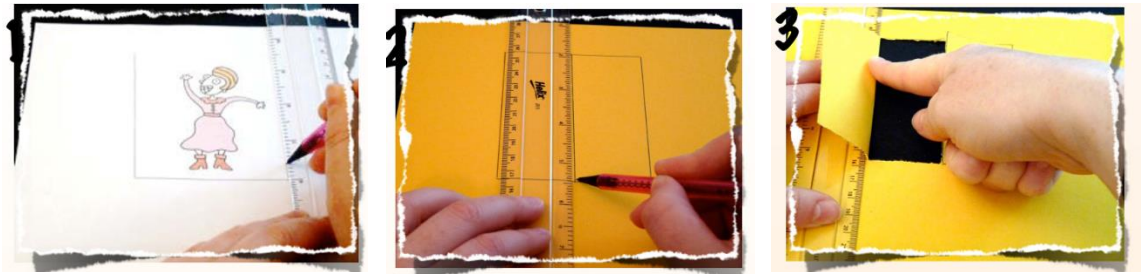
	Think about: • What story will you use? Will it be a story you know or a new one you will write? • How will you bind the pages of your book together? To make the design process easier, the children should all bind their books the same way. The book should be made from 4x (max) pieces of folded card that are glued together. See image. • Which fonts will you use? • What mechanisms could you use to fit in well with your story? • Who will your book be for?   Making: Practising the below skills will support children in being able to make their own pop-up story books: 1. Paper concertina: Take a long strip of paper or card and fold it into squares folding first one way and then the other. Keep going until you have folded the entire strip. Push the folds together. When the book opens, the concertina will spring out. You can stick objects to the end to jump out at the reader as they open the page.



2. Pop-up object: Fold the object you would like to pop out in half. Stick the two ends of the object between two pages of the book. Remember not to stick your object down flat. Make sure the object folds correctly so you can't see it when the pages are closed. When you open up the page, the object will pop out.



3. **Window flaps:** Draw and measure a box around the picture you would like to appear behind the window. Draw a box the same size on a separate piece of card and draw a line down the middle where you want the window to open. Carefully cut the top, bottom and middle lines with a craft knife or scissors, then fold back the left and right lines. Place the window card over the picture, making sure you line them up properly. Open the window flaps to reveal the picture inside.

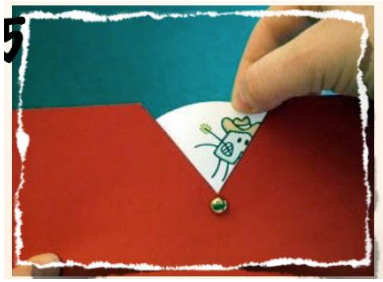


4. **Rotating wheels:** Draw some pictures on a wheel, making sure that the pictures will all be the right way round when the circle is turned. On a separate piece of card, cut out a window. They can be at the edge of the card or in the middle. Pierce a hole in the centre of the wheel. Place a blob of blu-tack or plasticine underneath then pierce

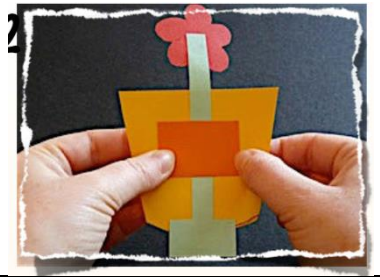
it with a sharp pencil. Pierce another hole on the card then put a split-pin through both holes, opening out the pin at the back. Now turn your wheel to reveal each of the different pictures.

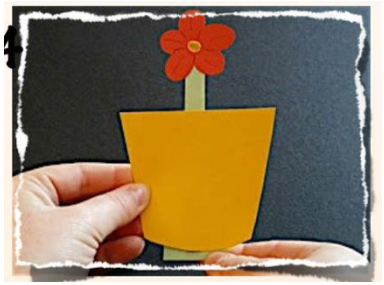






5. Lever: Stick a strip of card with a tab at the end to the object you want to be moved. Attach it using another strip of card stuck by both edges so the lever can still move. Pull the lever down when you want to hide the object. Push the lever up when you want to reveal the object.



6. Once designed and the children have practised all of the above skills, they will be able to make their pop-up storybook. This should be made of a maximum of 4 pieces of coloured card that are glued to bind the book. Binding should be the final step so that the children can manipulate the card to include their moving mechanisms.

Health and Safety:

- Some children may require support with cutting out areas of card e.g. piercing scissors through.
- Ensure split pins are split and flattened.

Other tips:

- Glue the pages together at the end so that the children can manipulate each page e.g. piercing and attaching levers etc…

Resources needed:

A range of coloured cards, coloured felt tips, split pins, scissors and glue sticks.

Outcome:

To produce a pop-up book which entices the reader.

Year 4

Autumn 2	Focus of Study: Textiles: Seasonal stockings
NC Objectives	Key Knowledge and Vocabulary
Designing • Generate, develop and communicate ideas through pattern pieces *Making* • select from and use a wider range of materials and textiles, according to their functional properties and aesthetic qualities • select from and use a wider range of tools and equipment to perform practical tasks (overstitch and applique) *Evaluating* • analyse a range of existing products; • evaluate their ideas and products against their own design criteria	Context for study: This unit follows on from learning in Year 2 where children will have experience of making a felt puppet. The children will have learnt to thread a needle, tie a knot, used a running stitch and fastened a button onto their puppet. This unit is the first where the children will be involved in the design process and will progress their sewing knowledge to be able to complete an overstitch. They will also use simple applique and add padding to the applique to create a 3D effect. The children will evaluate against a design criteria. Following this unit, in Year 5 the children will design and make a bag. They will further extend their knowledge to be able to back stitch and create a drawstring element. Knowledge Content: To know where, when and why Christmas stockings were first used. • A Christmas stocking is an empty sock-shaped bag that is hung on Christmas Eve. It is filled with small toys, sweets, fruit, coins or other small gifts when Father Christmas/ Saint Nicholas arrives. • It is thought that the Christmas stocking originated from the life of Saint Nicholas. Tradition in Western culture threatens that a child who behaves badly will receive only a piece of coal in their stocking. • The folk tale involves Saint Nicholas and a struggling family. A nobleman's wife died leaving him penniless and the sole parent to three daughters. The nobleman worried that nobody would wish to marry his daughters without a sizeable dowry. Hearing of the Father's worries, Saint Nicholas came to their home and filled the girls' stockings, which

were hanging above the fireplace to dry, with solid gold spheres so that they could marry after all.

To design your own final product and create a simple flow chart to show the method.

Evaluating products:

To evaluate existing products.

- Are the existing products well made? Are they sturdy?
- Do the existing products have an element of applique?
- Do they include an appropriate Christmas design in appropriate Christmas colours?
- Do the stockings have a hanging element?

Technical knowledge

- An overstitch can be used to sew two pieces of fabric together or to applique. It is also frequently used to sew a seam.
- Applique is used to apply something to a larger surface (such as a decoration).

Vocabulary (Know and understand the meaning of these words and how to use them).
Overstitch, applique

Designing:

Making Part 1: Practising skills

To develop skills to be able to use an overstitch and applique.

Practise an overstitch:

- Thread the needle and make a secure knot in the end of the thread.
- Come up through the fabric from back to front. Hide the knot between the two layers of fabric.
- Bring the needle through the fabric from back to front again. With each stitch, the needle should always come through in the same direction.
- Pull each stitch so the thread is right at the fabric edge, but not pulling it down tight.
- Keep stitch spacing even so that it looks neat and uniform.

Practice appliqueing a simple shape onto the fabric:

- Choose a simple design such as a star or Christmas tree and cut out the shape in fabric.

- Place the shape on top of your piece of fabric.
- You can use a simple running stitch or an overstitch to applique your design (practised in previous step. Running stitch learnt in Year 2 puppet unit).
- Leave a small gap and fill the shape with cotton wool/ excess felt to create a 3D effect. Stitch up the remaining gap.
- When you have stitched the whole way around, make sure tie a knot to finish before cutting off excess threads.

Making Part 2: The Christmas Stocking

- The children should all have access to the stocking template to cut around on their fabric.
- Use the overstitch practised in the previous steps to stitch around the edge of the two pieces. Explain to children why it is important that they don't stitch the top edge, so that the stocking has an opening.
- Children to choose and cut out a Christmas related pattern for their applique.
- Use either a running stitch or overstitch to applique the design. Fill with cotton wool or excess felt to create the 3D effect. Sew up the remaining gap and tie the knot securely.
- Create a loop shape with some ribbon and attach on the top, inside edge so that the stocking can be hung.

Evaluating Products:

Apply the same criteria to the evaluation which was used with the existing products.

Health and Safety:

- Ensure children are seated when using needles and scissors.

	Other tips: For children who are struggling to cut the felt fabric, give support where needed. Remind children to stay seated when using a needle. If leaving their seat, secure the needle in the fabric so that they know where it is. A self-threading needle may be used if children are continuously struggling to thread their own needle. Resources needed: Stocking templates, felt, embroidery threads, needles, cotton wool, existing stockings for evaluation. Outcome: To know why stockings are traditionally used at Christmas time. To design and make a stocking suitable for use using an overstitch and element of applique. Videos: Overstitch https://youtu.be/gmD9vpo5Fso?list=PL2vt_TPKQbZpAuVKmMVKmKID239UwrydL

Year 5

Autumn 1	Focus of Study: Structures: Building Bridges
NC Objectives	Key Knowledge and Vocabulary
Making • Select from and use a wider range of tools and equipment to perform practical tasks accurately; • Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities. *Technical Knowledge* • Apply their understanding of how to strengthen, stiffen and reinforce more complex structures. *Evaluating* • Explore their ideas and products against their own design criteria and consider the views of others to improve their work.	Context for study: This unit follows on from learning in LKS2 where the children will have completed the unit, 'Making Mini Greenhouses.' The learning is followed by 'Birdhouse Builders' in Year 6, where the children will design and make a birdhouse based on a design criterion. The children will have to use their existing knowledge of reinforcements and joins. Knowledge Content: To understand how structures (bridges) can be made strong. To develop a prototype bridge for a purpose. Technical knowledge

Pillars and beams to span gaps

The first types of bridges were probably either found (trees fallen across a stream) or made this way. **Beams** were used to span gaps. The more complex beam bridges have decks and slides called **parapets**- these make bridges stronger and easier to cross. The flat surface of the bridge is called the deck. The hand rails/ side section of bridges are called parapets.

Pillars are used to make bridges which span bigger gaps. The pillars of this old 'clapper bridge' have been made using cut and shaped stone.

Steel and concrete are often used in the construction of modern bridges. Beams and pillars made of these materials can be made much bigger, longer and stronger.

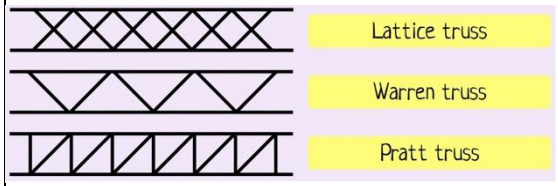
Beams and girders

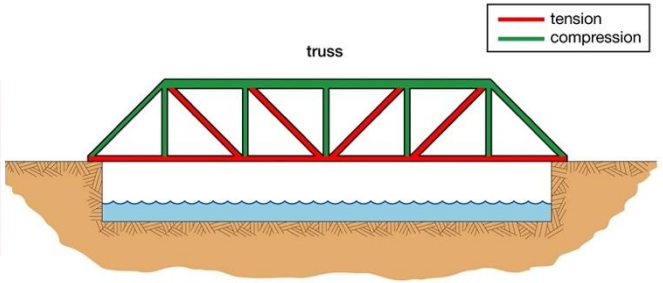
Beams are formed into different shapes for different purposes. Certain shapes (like the image to the right) are much stronger than others.

Modern materials and techniques mean that huge bridges can be built across deep water. Bridge pillars cannot be stood on the river bed- they would wash away. Instead, they stand on man-made islands with deep foundations called piers.

Truss bridges

A truss bridge is made up of several beams connected together in different ways. Engineers can make stronger, longer bridges by using **trusses** in their designs. The bridge deck runs through, or on tops of the trusses. Old structures can bend or sag because of the downward force of gravity. Imagine what could happen if bridges sagged in this way. Trusses help strengthen bridges by distributing weight along its length. The trusses most commonly used are **Lattice**, **Warren** and **Pratt** trusses.





Arches

Today arches can be made of iron, steel and concrete. Before this they were made of brick and stone. Timber is not suitable for creating arches since it would rot if it got wet. Arch bridges are designed to spread out the compression forces acting on the stone blocks and transfer them to the pillars at either end of the arch. (Look at the Pont du Gard in Southern France).

Suspension bridges

Suspension bridges are different to other bridge designs. The deck hangs from cables attached to pillars and anchorage points on their side of the bridge. The heavy deck pulls

down on the suspension cables, putting them under tension. For famous examples, look at Tower Bridge, London and Golden Gate Bridge, San Francisco.

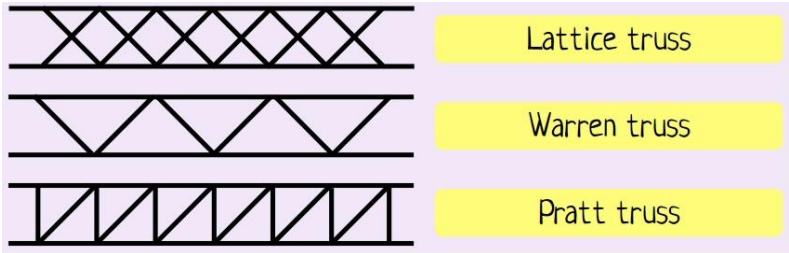
Making Part 1: Practise

- To test different beam cross-sections.

Cut, fold or roll sheets of card into the below cross-sections (you will need two of each shape). Place a flat deck made of card on top, like a bridge. Which beam design can hold the most weight?

- To test different truss designs.

Children to practise making the three different truss types (Lattice, Warren and Pratt). They should build a bridge strengthened with trusses spanning 40cm that can support 500g at its centre. Use art straws and sticky tape to create truss shapes.

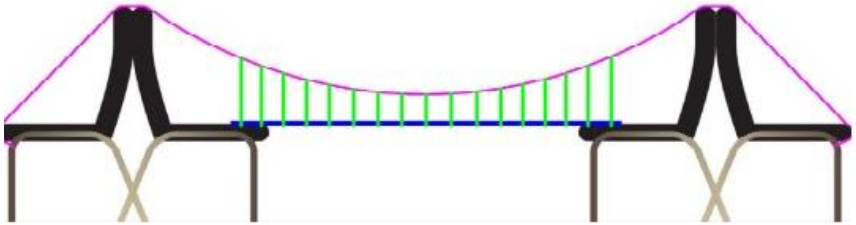


- To make an arch frame.

Make a gap by placing two heavy objects 15020cm apart. Bend a piece of card between the two objects to form an arch. Experiment with changing the distance of the objects. Experiment with different ways to make the arches stronger e.g. covering in polystyrene, sponge etc…

- Design a model suspension bridge.

Explain to the children that they are to design a model suspension bridge. It must have a smooth deck which a toy car can roll across.

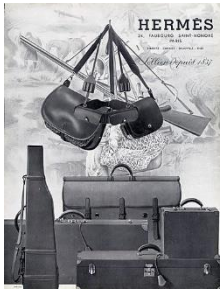


Making Part 2: The bridge

	• To develop criteria • To design a prototype bridge • To make a bridge using practised skills and design criteria Explain to the class the brief. A power station needs a new road bridge so that trucks and other vehicles can cross the river nearby. There is a lot of traffic travelling to and from the power station every day. Some of the vehicles are very heavy. Boats use the river. The approved location for the new bridge is 50m wide. Some of the boats that use the river are up to 20m high. Local residents and the power station's director want a design that is functional and attractive. Design a bridge and build a prototype model to scale. Give the class time to develop a criteria. • The bridge must span a gap of 50m • It must allow traffic to pass in both directions • It must have a clearance of at least 20m • It must be strong • It must be attractive • The prototype model for this bridge will be 100:1 scale. Explain that this will mean 50cm long and 20cm off the ground for clearance. The only equipment and materials that will be available to the children: • Scissors • Paper/ card • Sticky tape • Glue • Paper straws • String

	Evaluating products: • To analyse a prototype based on a design criteria. The children will need to answer questions based on the design criteria. Children will need to ask other members of the class about the attractiveness of their model bridge and note their comments. Key Vocabulary: Beams, parapets, pillars, trusses, arches and suspension. Resources needed: Scissors, paper, card, sticky tape, glue, paper straws and string. Outcome: To create a bridge that fits a design brief.

Spring 1 Year 5	Focus of Study: Textiles: Bags
NC Objectives	Key Knowledge and Vocabulary
Design • generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams and pattern-pieces *Making* • select from and use a range of tools and equipment to perform practical tasks (joining and finishing) • select from and use a wider range of materials according to their functional properties and aesthetic qualities *Evaluating* • understand how key events in design and technology have helped shape the world • evaluate their ideas and products against their own design criteria and consider the views of others to improve their work	Context for study: This is the third textiles unit of work. The children will have already completed textiles units in Year 2 (Puppets) and Year 4 (Seasonal Stockings). The children will have already practised and applied skills including a simple running stitch, over stitch and appliqueing a simple shape onto a fabric. In this unit the children will advance their skills to include a back stitch and embroidery. The children will also create their own template. Knowledge Content: To design and use a pattern to create a functional item- bag. Technical knowledge Clothes did not have pockets until the 17th century, so men and women alike carried bags. While some bags were appropriate for the working class (like messenger bags), others were specifically styled for the elite. Secret compartments and highly designed bags were ultimately prized and considered to be a high-status symbol. The first known bag dates back to between 3400 and 3100 BCE. It is the oldest preserved bag belonging to a man nicknamed 'the Tyrolean Iceman' found on the Similaun mountain on the border between Austria and Italy.  Bags were also depicted in Egyptian hieroglyphics as waist pouches, which were carried around on the hip. The Bible specifically identifies Judas Iscariot as a

	‘purse carrier’. These were constructed out of durable leather or precious cloth and overall, the pouch stored valuables such as coins.   In the 14th and 15th centuries, bags were called ‘purses.’ A purse was attached to a girdle belt and it dangled from the waist. Some of the purses were drawstring and hung from the girdle on a long cord. During the Medieval ages curious designs appeared on purses, associated with marriage and betrothal. They commonly showed love stories embroidered onto the fabrics. Fashion dramatically changed in the 16th and 17th century. Women began to wear their girdle under their skirts, most notably in the Elizabethan era when women’s skirts expanded to enormous proportions. Consequently, the pouch was inevitably getting lost and had to make a definitive move. Women began wearing long embroidered purses under their skirts and breeches. Similarly, men began to wear leather pockets inside their breeches, which they called bagges. It is thought these fashions contributed to the invention of pockets in clothing.  The 18th century had an acquired taste for more slender and narrower dresses. This meant that pockets were discarded and the handbag sprung forth again coined the ‘indispensables.’  The bag has always found a way to remain relevant. With this in mind, by 1843 Great Britain had 2,000 miles of railway lines and the traditional purse had to adapt to become helpful to commuters. The bag now

	needed the capacity to hold larger items. Some of today's most notably designers started out as luggage manufacturers in the 18th century, including Thierry Hermes- a harness and saddle maker. In the 21st century, both men and women alike strap or sling hands-free, genderless bags over themselves every day. Conscious designers now design bags that are waterproof, made of faux reptile skins and vegan leathers.  Making Part 1: Practise • To practise a backstitch. Explain that a backstitch gives you a continuous stitch with no gaps (best for hand sewing) (To be practised on a piece of scrap fabric. Thread a needle and tie a know in the end of the thread. Draw a pencil line on your fabric if needed to mark your backstitch line. Poke the needle up from beneath the fabric at one end of the line. Then, push the needle back down through the fabric roughly 1cm away. Come back up through the fabric another 1cm away in distance, but this time go backwards and through the fabric at the end of your first stitch. Come back up one stitch away and then back through at the base of the previous stitch. • To practise embroidering a design onto fabric. Explain that the definition of embroidery is the process of forming a decorative designs with hand or machine needlework. Explain to the children that their drawstring bag will have to have an element of embroidery using a running stitch. They will have used a running stitch in their Year 2 and Year 4 units of work on textiles. The deign should be simple e.g. a swirling pattern, flower or basic shape. • To draw a final design and add labels (cutting lines, stitch lines, front/back, seam allowance and fold lines). You may wish to have the children draw a cross sectional diagram so that the drawstring element is clearer.

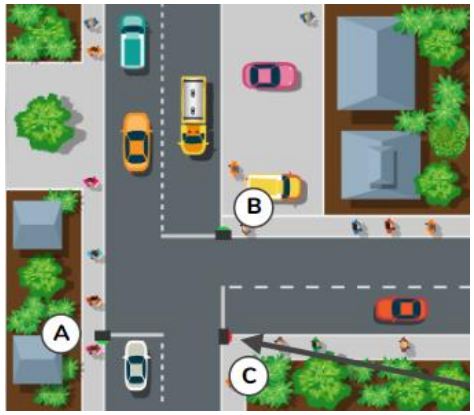
	Making Part 2: The drawstring bag Explain the design brief to the children: • You must create a purposeful bag with a fastening (drawstring). • You must include a decorative element (embroidery). • You must ensure that your bag is aesthetically pleasing e.g. your sewing is neat and there are no gaps in your stitches. • On your tracing paper you are going to make a pattern template for your drawstring bag. You will need to draw a rectangle that is 10" x 13" and cut this out. • Use tailors chalk to draw around the pattern onto your fabric. You will need to do this twice so that you have two pieces of fabric that are 10" x 13". • Cut out both pieces using pinking shears. • With the reverse of the fabric facing up, fold over the top edges roughly 1cm and iron in down. • Place both pieces of fabric together (right side of fabric facing inwards). • From the top, measure 2" down and pin on both sides. • From the measured 2" point, sew around the edge of the bag (1.5cm in) using a backstitch. A backstitch will mean that there are no gaps in the sewing. • Sew seam allowances open (optional for a better finish). • The 2" at the top of the back on either side should now be folded over and sewn using a backstitch again. • The 2" at the top of the bag which was pinned will now be folded down approx. 1" on either side. Pin these in place and sew along the casing using a backstitch. • The hems can be trimmed using the pinking shears to avoid excess fraying. Be careful not to cut into the sewing.

	• Turn the bag the right way round and insert ribbon into the drawstring casement from one side all the way around until it comes out on the same side. Repeat with another piece of ribbon travelling the other way from the other side. • Tie the ends of the ribbons in knots to stop them fraying. • You will now be able to pull the drawstrings to close the bag. • Decide which piece of fabric is to be the front and embroider (using a running stitch) your chosen basic pattern or shape onto the front. Evaluating products: • To evaluate against the design criteria: evaluate the stitches and the decorative element. Other: • Use water to help wet the ends of the thread before threading the needle. • An adult should complete the ironing elements of the making. • It may be useful to attach a safety pin to the ribbon whilst feeding through the drawstring casement. Key Vocabulary: Needle, thread, knot, seam, fabric, backstitch, drawstring Resources needed: Two pieces of fabric (cotton will work best) 10” x 13” Two 24” pieces of ribbon Pins to hold fabric together Tailors chalk Tracing paper Pinking shears Sewing thread

	Sewing needles An iron Video links: Backstitch How To - Basic Sewing (Embroidery & Hand Sewing) - YouTube Learn to Sew a Drawstring Bag - Beginner Sewing Project - YouTube Outcome: To create a purposeful bag with a drawstring element.

Year 6

Autumn 1	Focus of Study: Structures: Programming Pioneers
NC Objectives	Key Knowledge and Vocabulary
Design • Use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups; • Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design. *Technical Knowledge* • Apply their understanding of computing to program, monitor and control their products. ***Evaluating*** • Explore their ideas and products against their own design criteria and consider	Context for study: This unit follows on from learning in LKS2 where the children will have completed the unit, 'Light up signs' and 'Torches'. Previously, the children will have used components (circuits, bulbs and switches) to make their products. In this unit the children will learn about and apply their understanding of computing to program, monitor and control their products. Knowledge Content: To explain how computers and computer programs are used in a variety of products. To develop an idea and write a program to monitor and control it. Technical knowledge • Simple electrical systems are used in products all around us. A steam iron uses only electrical components; there are no computer controlled parts inside it. A thermostat is a device that can control temperature and a switch on or off at a specific temperature. A hot plate is heated until the temperature set by the thermostat is reached; the thermostat turns off the indicator lights, showing that the iron is hot enough to use. Other examples include a kettle, security light and electric toothbrush. • A washing machine is more complex and is controlled by a computer system. A washing machine has complicated instructions which cannot be memorised or

the views of others to improve their work.	controlled by a simple electronic system. The programmes must be stored in computer memory and controlled with a computer system. • Memory chips store data by setting thousands, millions or even billions of tiny switches (called transistors) in on or off positions. The changes in the level of electrical current flowing through the open or closed switch can be read and interpreted.  • Traffic lights are monitored and controlled by a computer system. Traffic lights A and B are set to green. Traffic light C is set to red. If the sensor on traffic light C detects a car approaching, a ten-second countdown timer starts. After ten seconds, traffic lights A and B change to red. Once traffic lights A and B have finished changing, traffic light C changes to green. A twenty-second countdown timer starts. After twenty seconds, the lights will all change back to their starting setting.  • Some products which are monitored and controlled by microcontrollers may be designed, prototyped and tested on a breadboard. The programmer writes a set of instructions in human language, and then turns those instructions into an **algorithm** written in computer code which the microcontroller understands. The final design is made on printed circuit boards (PCHs). The program is stored on a microcontroller on the PCB. • Alan Turing was a computer scientist and engineer. He developed lots of theories and ideas which transformed the way computer engineers develop systems and products today. He worked with a team of hardware and software engineers to develop computers which intercepted German messages between military

commanders during the Second World War. Many believe that the codebreaking work of Turing and his team of computer engineers shortened the war and saved millions of lives.

- **Debugging** means finding and fixing faults in a system. We can find faults by re-writing the computer code that controls the computer part.
- Famous programming pioneers include Charles Babbage and Ada Lovelace (who created the first mechanical computer) and Steve Jobs and Steve Wozniak (who co-founded Apple).
- Embedded systems in products such as lifts constantly monitor their buttons and other sensors. They 'wait' until they detect an input signal from a button or sensor, then run a set of instructions accordingly. Many sensors are only 'on' or 'off', sending either a high or a low output to the embedded computer system which monitors them.

For example, the buttons for each floor are 'off' until they are pressed. When pressed they send a high output to the system, which responds according to its programming. Other sensors, such as the mass sensor in the lift compartment, send a variable output; the greater the mass inside the lift, the high its output.

Making Part 1: Practise

- Children to have a go themselves at writing the instructions for the traffic light image above. Then children should have a go at writing instructions for how a vending machine works.
- Children to use the 'Pelican Crossing' project in Scratch to try to program a woman to cross a road safely. pelican crossing on Scratch (mit.edu) Solution pelican crossing solution on Scratch (mit.edu)
- Can the children write a set of instructions which an embedded system could use when it detects the 'call lift' button on the ground floor has been pressed?

	• Do you have any ideas for how embedded systems could be used in rooms, for example a recording studio, changing room with showers or an MRI scanning room? How could you use embedded systems in your own home to make life easier, safer or more energy efficient? Making Part 2: The embedded system • To model and communicate ideas, using either prototypes or computer-aided design. Children should first of all sketch their room with an embedded system. Children are then to use art and/or DT materials to make shoebox models which show how the computer-controlled system they have previously programmed could be embedded in a room (e.g. a doorbell system or smart home with automatic lights). Alternatively, use CAD software such as www.winkercad.com to design simple rooms. Children should also write the programming instructions to go alongside their model embedded system. Having made their room model, children should write an inspiring description of their embedded system product which would make people want to buy it. The equipment and materials that will be available to the children: • A shoe box • Art materials including glue, card and art straws Evaluating products: • To evaluate your design for a computer-controlled system and consider the views of others to improve your work. • While developing your prototype products, what did you learn from others which helped you develop or improve your own design?

	• How did making sketches or models of your room system help you develop it, improve it and explain it to others? • Children to answer evaluation questions and explain one way in which someone else, or someone else's design, helped them improve their own design. o While designing your product, explain how you developed and shared your ideas. Include information about how you used sketches and models. o Describe something you have learned about computer scientists and how they have changed the world. o We design products to solve problems. What problem was your product designed to solve? How did the computer program you write solve this? o Describe how you debugged and/or improved your program. o Explain one way in which you improved your product design by learning from others. Key Vocabulary: Simple electrical system, electrical components, computer system, algorithm, debugging, embedded system, programming and pioneers. Resources needed: Access to Scratch per child, shoebox per child, art materials. Outcome: Children will have created a model which includes an embedded system. They can explain how it works using a set of programming instructions.
Spring 1	Focus of Study: Structures: Birdhouses
NC Objectives	Key Knowledge and Vocabulary
Designing	Context for study:

• generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and CAD *Making* • select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately • select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities *Evaluating* • investigate and analyse a range of existing products • evaluate their ideas and products against their own design criteria and consider the views of others to improve their work *Technical knowledge and understanding*	This unit is the final unit of structures, building on learnt skills from Y1, Y3 and Yr5. Most recently, the children will have studied the unit 'building bridges' in Yr5 where they will have learnt how to make structures stronger and improve joins. Knowledge Content: To evaluate existing products. To design individually using a criteria. To identify appropriate joins to attach and strengthen. Technical knowledge While we normally think of birdhouses as a way to protect nature and increase the amount of birds in our area, that was not always the case. Birdhouses in some places in Europe were used initially as a trap to capture eggs and even birds. These birdhouses were typically made of clay and were built like a vase; however, in most cases birdhouses have been used to protect wild birds from harsh weather and predators as well as a location to live. Why do birds use birdhouses? Some birds are not capable of creating their own nesting because their beaks are specialised for hunting insects or gathering seeds. Some birds have to rely on using tree cavities which have been created by other birds, such as woodpeckers. Nowadays, forest land has greatly decreased because of agriculture and urbanisation. Many trees that were once suitable for nesting are now not structurally stable. Birdhouses have been used as a solution to the lack of natural cavities. Finding birdhouses designed specifically for the favoured bird is key to their use and success. Bird species prefer different nesting conditions, whether it is the size of the entrance hole or

• apply their understanding of how to strengthen, stiffen and reinforce more complex structures	the height the birdhouse is placed off the ground. Often, birds will use a birdhouse to shelter from harsh weathers. Different birds require birdhouses of different designs. The three most common birds in Greater Manchester are the House Sparrow, Starling and Blue Tit. All three of these birds require birdhouses with different designs. House Sparrow: The birdhouse should be placed in a leafy area with lots of shrubbery and trees nearby. The birdhouse should be placed 5 to 15ft off the ground with a 32mm entrance hole. Starling: Requires a birdhouse that is attached to your home or mature tree. It should be placed 10ft off the ground with an entrance hole of 45mm. Blue Tit: Requires a birdhouse to be placed in a shaded area 6 to 13ft off the ground with a 25mm hole. Having an entrance hole that is too big or too small will result in attracting the wrong kind of bird to your birdhouse. Evaluating products: Evaluate the birdhouses in the images based on these questions: • What are they made from? • What works well? • What could be improved?

	• Does the birdhouse look suitable to house a bird? Why/why not?    

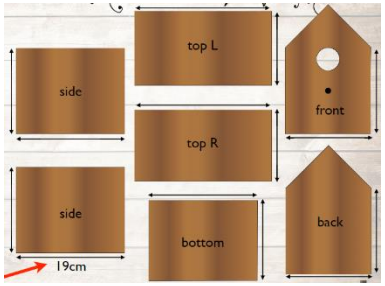
Vocabulary (Know and understand the meaning of these words and how to use them).

Flat pack diagram, 3-D Diagram, Exploded diagram, flush

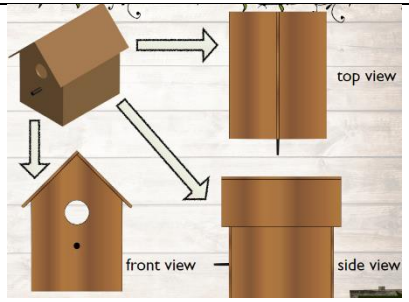
Designing:

Before a birdhouse is constructed, a diagram needs to be drawn and a plan written to ensure the dimensions of the wood are correct and will fit together accurately. We are going to learn how to draw three types of diagrams:

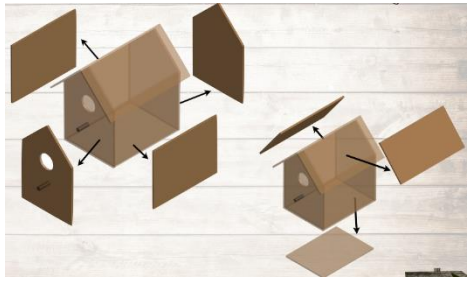
Flat pack diagram: Shows you all the pieces and dimensions needed to make a birdhouse. Lines are also drawn to show length and width measurements of sides.



3-D diagram: This type of diagram shows you a different view- the front, side and top views.



<u>Exploded diagram</u>: They show a 3-D object with the parts pulled apart. The parts fit back together accurately if the measurements are correct.



Explain to the class that this is the birdhouse that they are going to be making (show image below). Their task is to complete diagrams in all 3 styles (flat pack, 3-D and exploded) for this birdhouse. The packs should be available for the children to access the pieces and provide measurements. The children could measure the entrance hole to determine which type of bird will use the birdhouse.

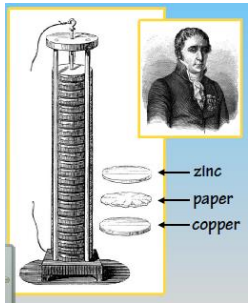
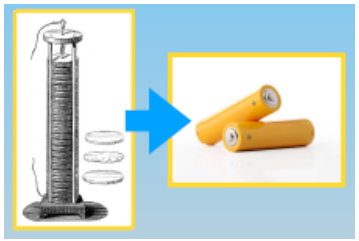
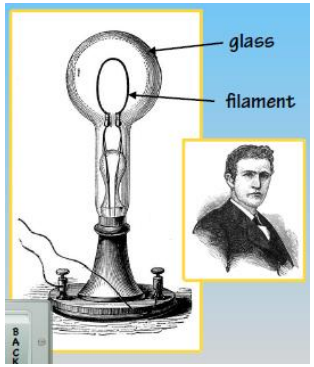
	Making: Model making the joins: Using glue: Explain to the children that all of the joins can first of all be glued. This only needs to be a thin layer of glue that will hold provisionally until you nail your joins in place. Using nails: Model holding the two pieces of wood that need joining in place. You may need to use the edge of the table to hold angles in place. First hold the nail in place to ensure it stays at a 90 degree angle to the wood and then use the hammer for the first few hits until it is held in place. The first few hammerings of the nail should be lighter as your fingers are close by. Explain to children that their precision is very important to that they do not hit their fingers with the hammer. Once the nail is held in place, move fingers away and hammer the nail down so that it is flush with the wood. Explain that in carpentry, flush means perfectly flat. Health and Safety: • The class should always be supervised whilst using nails and hammers. • Support your partner by holding joins in place whilst they hammer. • Only hold the nail for the first light hammerings to keep the nail in place. Fingers should be moved well away once you begin hammering harder. Other tips: • Pre glue the joins so that they are held together before you begin hammering nails into the joins. This will make it easier to hold in place. Resources needed:

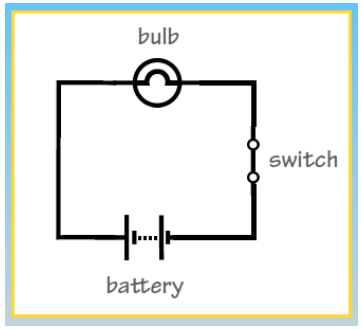
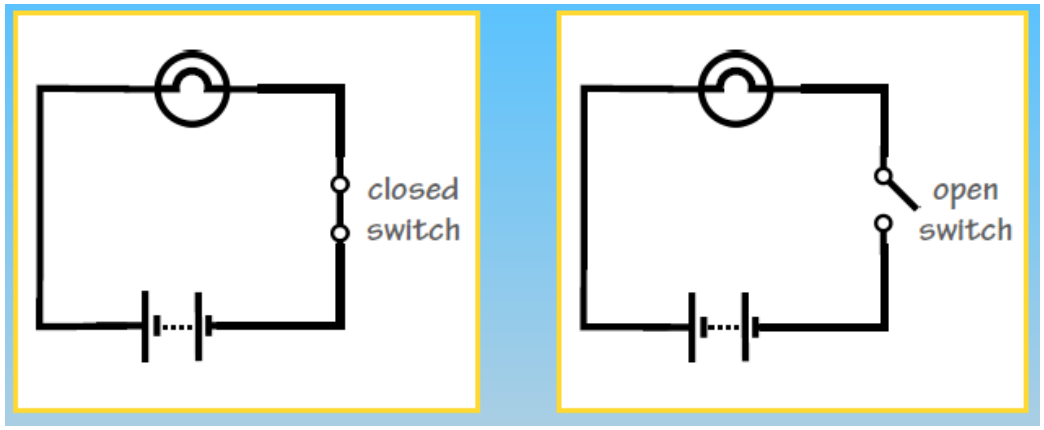
	• Pre packed birdhouse boxes to make (with glue, hammers and nails inside). Outcome: • To make a suitable and safe house for a bird in the local environment.

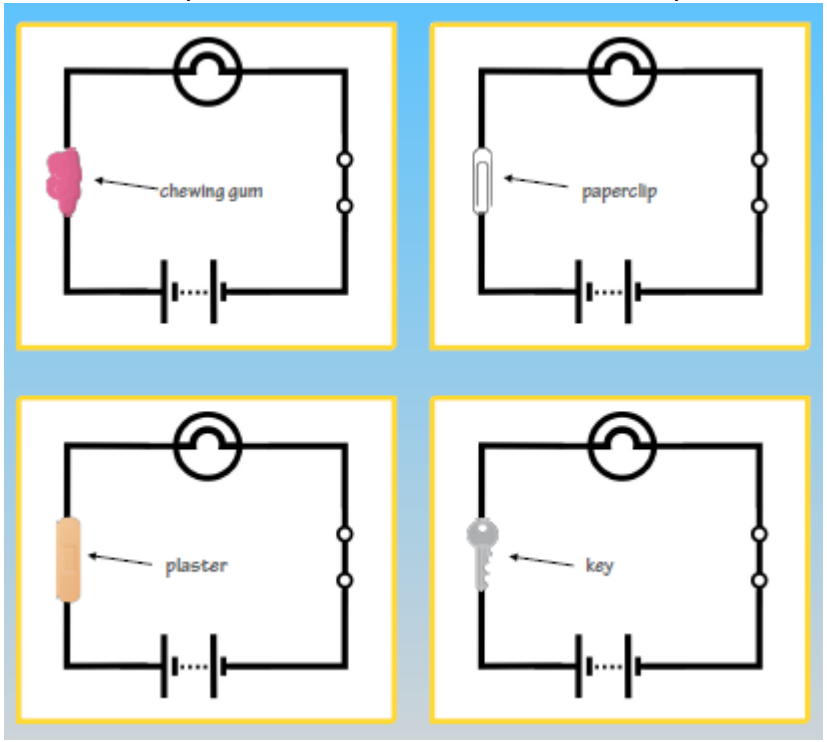
Spring 2 Year 3	Focus of Study: Textiles – Making a pencil case
NC Objectives	Key Knowledge and Vocabulary
Designing • generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and CAD *Making* • select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately • select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities *Evaluating*	Context for study: This is the second textiles unit of work and builds on knowledge gained in the Year 2 puppets topic where pupils learn to use a simple running stitch. In this unit pupils will develop their use of this stitch to incorporate a zip element for their pencil case. This unit is the pre-cursor to the Year 4 Seasonal Stockings unit where pupils will use the applique technique to create a 3D effect. Most recently, the children will have studied measurement in maths and this is a practical application of the knowledge gained. Knowledge Content: To evaluate existing products. To design individually using a criteria. To identify appropriate joins to attach and strengthen. Technical knowledge Evaluating products:

• investigate and analyse a range of existing products • evaluate their ideas and products against their own design criteria and consider the views of others to improve their work *Technical knowledge and understanding* • apply their understanding of how to strengthen, stiffen and reinforce more complex structures	To evaluate existing products: Designing: Making: Health and Safety: Other tips: Resources needed: Outcome:

Spring 2 Year 4	Focus of Study: Electronics - Torches
NC Objectives	Key Knowledge and Vocabulary
Designing • generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and CAD *Making* • select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately • select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities *Evaluating* • investigate and analyse a range of existing products • evaluate their ideas and products against their own design criteria and consider the views of others to improve their work	Context for study: This is the first electronics unit of work and builds upon the learning children will have done in Science with circuits. The children will already have practised and applied their knowledge of circuits and the required components to build a working circuit. In this unit the children will apply their knowledge for a real life purpose. Knowledge Content: To design and use a functioning torch. Technical knowledge   A torch is a portable, handheld electric lamp which is usually powered by batteries. The casing will need to be robust and sturdy given the nature of its function. The battery-powered torch needs an electrical circuit to work.

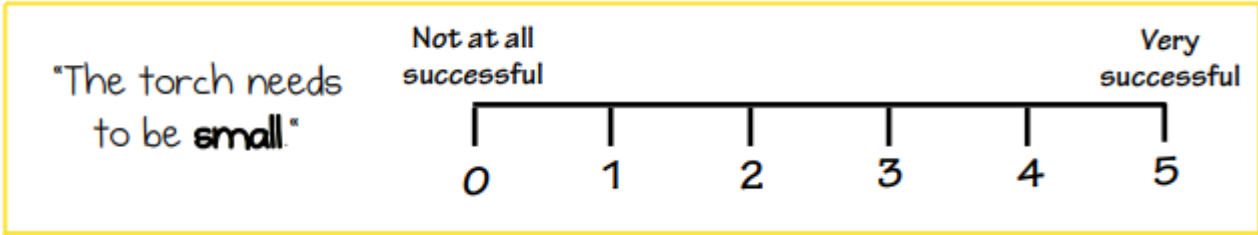
Technical knowledge and understanding • apply their understanding of how to strengthen, stiffen and reinforce more complex structures	  The battery was invented first, in 1800, by an Italian called Alessandro Volta. It was made by stacking discs of zinc and copper in a pile, separated by paper soaked in a saltwater solution. Volta tested the battery by giving himself small electric shocks! Remind children of the dangers of misusing batteries and brief pupils in safe and proper use.  Thomas Edison invented the first practical, long-lasting lightbulb in 1879. He used an airtight glass case with a piece of looped wire (the filament) inside. When connected to a power source, the filament heated up and glowed white hot. Evaluating existing products – become 'enlightened': Provide children will different torches to look at. Facilitate a discussion around the materials used. What would this type of torch be used for? Who might use this type of torch? Why? Allow pupils to remove the batteries (where possible) and explore the components for an electrical circuit that would be in a torch. Can you identify and name the different components?

	Investigate electrical circuits using different materials to make a **switch**.   Check pupils can assemble a circuit with a switch, light bulb and battery. Provide pupils with a range of conductive components (paperclips [not plastic-coated] split pins, drawing pins, staples, aluminium foil to build a prototype circuit) and allow them to explore a simple closed circuit with a switch. Explain that it's not only wire that can conduct electricity around a circuit. Most objects that are made out of metal are conductors (allows electricity to pass through them). Show an incomplete circuit. Can they identify why the bulb does not light?

	Share a variety of different materials. Which do they think will light up?  Explain that the wires are used to join the bulb, batteries and switch together in a type of loop known as a circuit. Explain that this allows the stored power from the batteries to flow through the wires and light up the bulb. Materials that allow electricity to pass through are called conductors. Which materials are not conductors? The battery and bulb are both essential components in a circuit for a torch. Without the battery, there would be no power and without the bulb, there would be no light.

	Explore a simple electric circuit using the correct symbols for each component. Look at switches and how, when closed, the circuit is complete and the bulb will light up. Pupils make their own switch using what they have learn about circuits and materials that will conduct electricity. **Design Casings** for a torch: Gather kitchen roll tubes, plastic bottles, joining materials e.g. sticky tape, masking tape. Explore which part of the torch is the 'casing'. The casing holds all the different parts of the device, including the circuit and the reflector. Explore what properties the casing may need to have and why (strong, hard, waterproof, does not conduct electricity) Explore a variety of possible casings and whether they could use each one as a torch casing. Why?

	After, ask pupils if they were going to make a casing for a torch, which material they would use and why. Encourage pupils to explain their choice. Explain design brief to the children: I am going camping this weekend with school. I need a torch to help me find my way to the toilet block during the night! It needs to be strong, comfortable to hold and small enough so that it won't take up much room in my bag and it should be easy to switch on too. • You must create a safe, robust and waterproof casing • You must include a switch • You must ensure that there is a working circuit within the casing • You must ensure that the torch is comfortable to hold and aesthetically pleasing e.g. the wires are neat and there are no holes within the casing. • First, use the components you have been given to make an electrical circuit. Now you are going to test out a range of different casings. Ask yourself the following questions: • How will you attach the circuit to the casing? • Will the casing be strong and secure? • Does the circuit fit well inside the casing? • Where will you put the switch so that it is easy to turn on and off? • Would it be easy and comfortable to hold? • Is there an opening to access the bulb and battery for replacement parts? Elicit the design criteria from the brief: strong, small, easy to switch on and comfortable to hold. Pupils will draw and label four casing ideas, highlighting the advantages and disadvantages of each. By the end of this session, pupils must have an idea of the type of casing they feel will work

	best for the torch. Pupils will need to bring in plastic bottles, tubes etc. from home to act as their casing. Making the torch to meet the design criteria Give pupils time to look over their design sheet from the previous lesson. Encourage pupils to think carefully about their order of work: what they will need to do first, next, last. Encourage pupils to write a plan of how they will assemble the circuit. Pupils must create a list of materials and equipment before starting. Once they have started, it's important they don't rush. Evaluating the product: Using a sliding scale, explore the design criteria and brief from the previous lesson: is the torch small? Is it comfortable to hold? Is it strong? Is it easy to switch off and on? Is the circuit securely attached? Are the wires and battery hidden? Encourage pupils to explain their choices to a partner.  • Which part of your finished torch are you the happiest with, and why? • Which part of your finished torch would you like to change, and why?

Revisit the questions from previous sessions: does it meet the design criteria? Have appropriate materials for the casing been chosen?

Focusing on the design criteria, pupils evaluate how well their finished product meets each design criteria.

	Design Criteria	Success score (out of 5)	Reason for score
1			
2			
3			

Health and Safety:

When working with circuits, it is incredibly important to ensure pupils do not use batteries with a voltage higher than required for the bulb to light. This can pose a fire risk. At the end of each

	lesson, all components must be disassembled from the battery to prevent overheating from a current. Other tips: Consider how the light bulb will be secured into place. Resources needed: • A range of different torches • Components for switches: paper clips (not plastic-coated) split pins, drawing pins, staples, bulldog clips, aluminium foil • Masking tape, scissors, • Single-use plastic water bottles, plastic tubes • Circuit components: bulbs, batteries, wires, switches. Outcome: A functioning torch for a camper.