ST LUKE'S CHURCH SCHOOL

Design Technology Curriculum

Year 1 to Year 6

Autumn 1

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		sMini Castles
Year 4		Seasonal Stockings		Torches		Seasonal Food
Year 5	Building Bridges		Fashion and textiles (bags)		Slingshot Car	
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 takes influences from planning provided by Plan Bee and Kapow as this serves to support non-specialists while providing the backbone to an ambitious curriculum. 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.

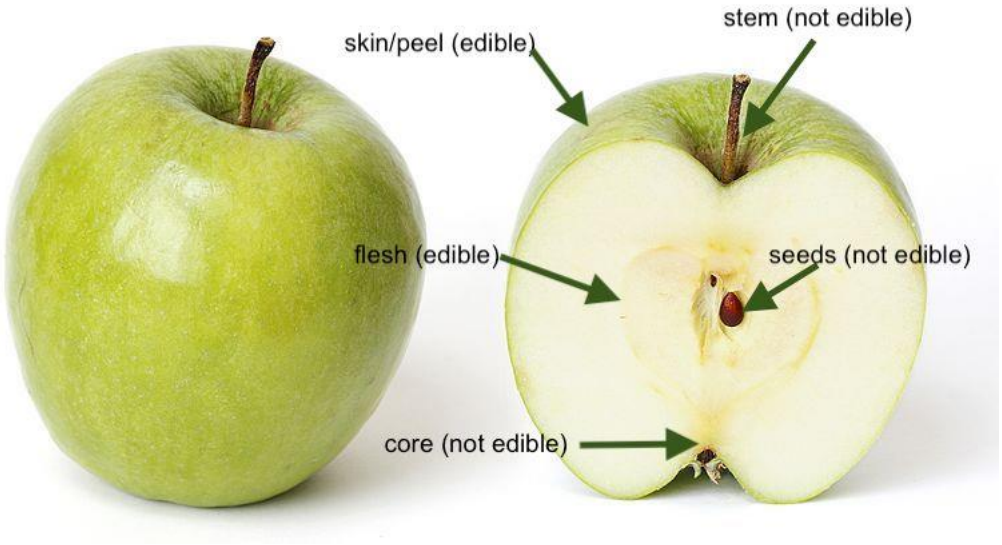
Autumn 1 Year 1	Focus of Study: Food: Eat More Fruits and Vegetables
NC Objectives	Key Knowledge and Vocabulary
Designing • design purposeful, functional, appealing products for themselves and other users based on design criteria • communicate these ideas through talk *Making* • select from and use a 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	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

- Know some basic concepts of health and safety when preparing foods

To know where these fruits and vegetables are grown:

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

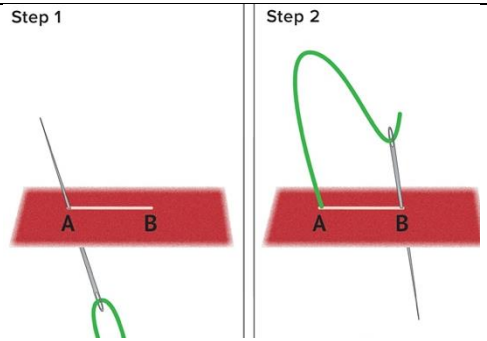
1. To decide what to include in the fruit salad.

	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.

Autumn 1 Year 2	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.

Autumn 1 Year 5	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 Castles.' The learning is followed by 'Birdhouse Builders' in Year 6, where the children will design and make a birdhouse based on a design criteria. 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.

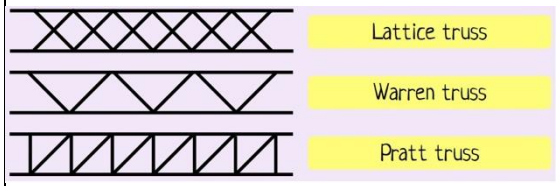
Beams and girders

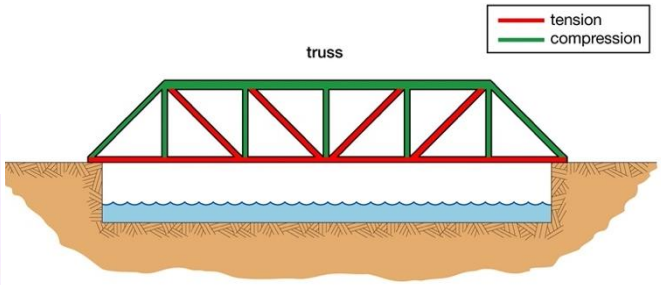
Beams are formed into different shapes for different purposes. Certain shapes (like the image to the right) are much stronger than others.

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

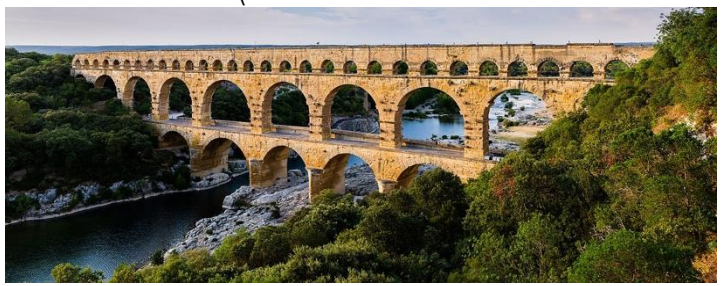
A truss bridge is made up of several beams connected together in different ways. Engineers can make stronger, longer bridges by using trusses in their designs. The bridge deck runs through, or on tops of the trusses. Old structures can bend or sag because of the downward force of gravity. Imagine what 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.

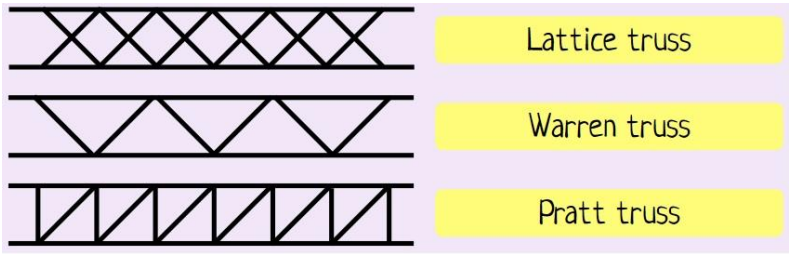
Making Part 1: Practise

- 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.

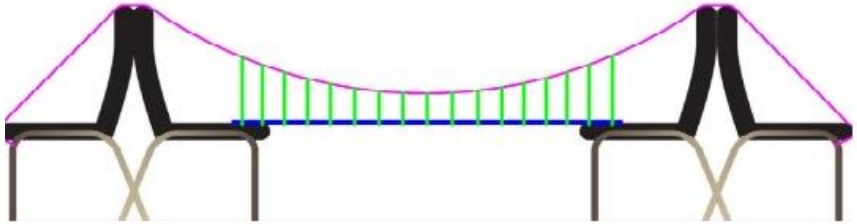


- To make an arch frame.

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:

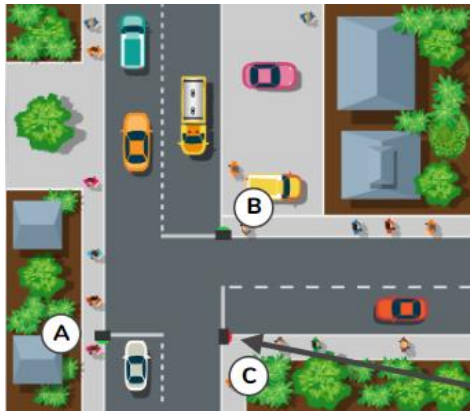
- To analyse a prototype based on a design criteria. The children will need to answer questions based on the design criteria. Children will need to ask other members of the class about the attractiveness of their model bridge and note their comments.

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.

Autumn 1 Year 6	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 Year 4 unit, '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

the views of others to improve their work.	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 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. ○ While designing your product, explain how you developed and shared your ideas. Include information about how you used sketches and models. ○ Describe something you have learned about computer scientists and how they have changed the world. ○ We design products to solve problems. What problem was your product designed to solve? How did the computer program you write solve this? ○ Describe how you debugged and/or improved your program. ○ 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.