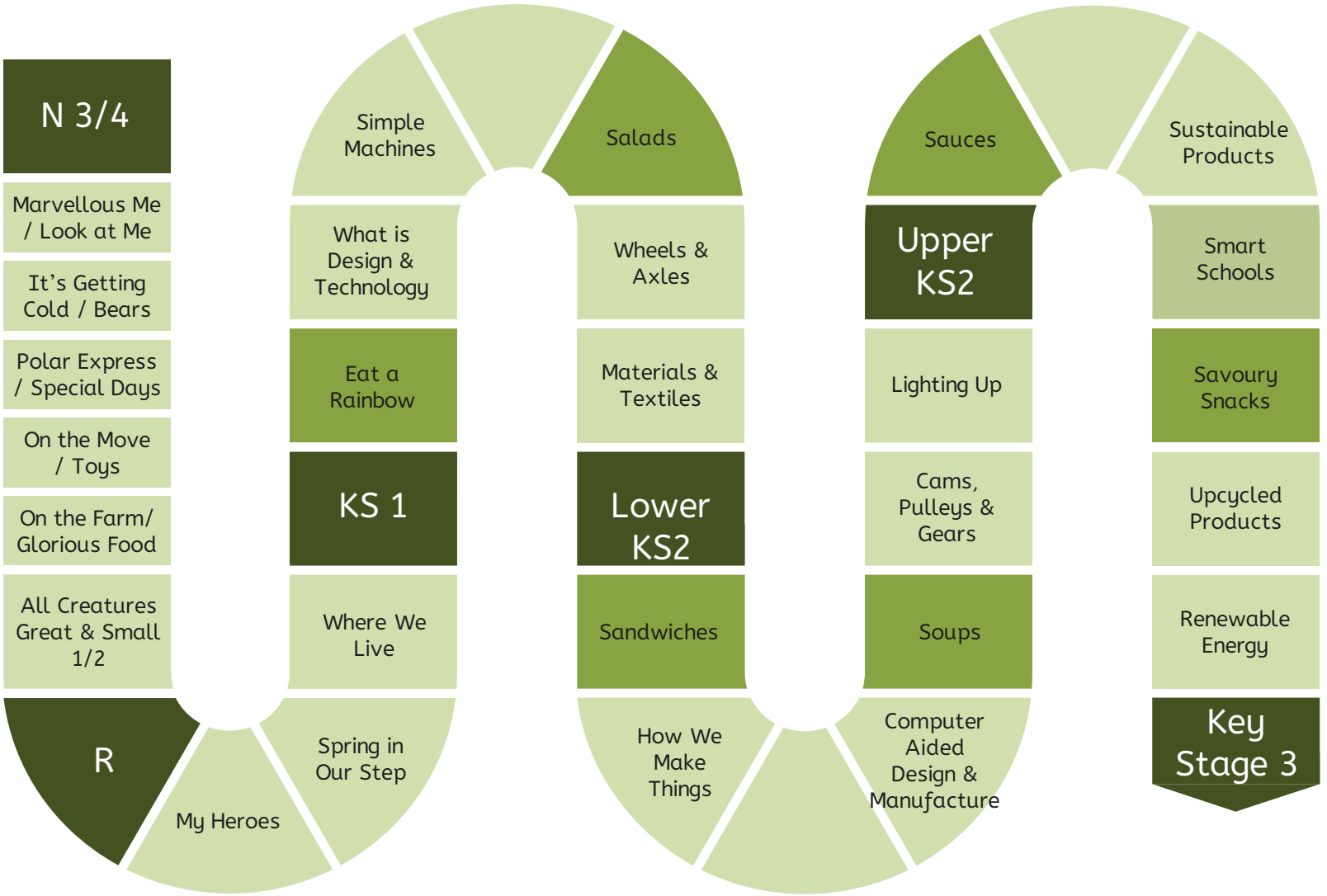
United Curriculum: Design & Technology



Progression in Design & Technology

Vertical Concepts

- Responsibility
- Design in the Past, Present & Future
- Designing
- Materials
- Making
- Structures
- Mechanical Systems
- Electrical Systems

Procedural

- Tools, Materials & Components
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- Product Analysis
- Design Values & Criteria
- Designing
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- Evaluating

The **Responsibility** Vertical Concept gradually introduces the 'Responsible Decision-Making' Framework to pupils. Pupils will apply this knowledge through:

Procedural How they select and use materials, tools and components when making products and prototypes.
Disciplinary Use of the Responsible Decision-Making Framework when analysing existing products, creating design criteria, designing and evaluating prototypes and products.

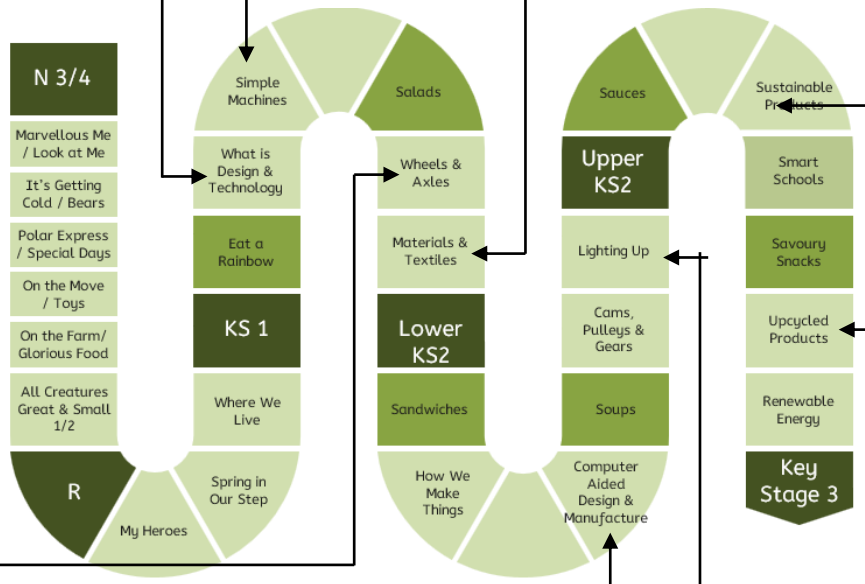
Evaluating products and prototypes based on the values of **Materials** & **Function** (elements of the Responsible Decision-Making Framework).

Analysing products and using design criteria based on the values of **Materials** & **Function** (elements of the Responsible Decision-Making Framework).

Re-using and **re-purposing** things we no longer want or need helps to protect our planet by making less rubbish and saving natural resources.

Making products and prototypes by reusing waste materials e.g. waste packaging.

Evaluating products and prototypes based on the values of **Materials** & **Function**



Positioning paper templates or patterns on materials in a way that reduces waste.
Analysing products and using design criteria and evaluating based on the values of Materials, Function and **Aesthetics.** (elements of the Responsible Decision-Making Framework).

The '**Responsible Decision-Making Framework**' can be used when analysing existing products, developing design criteria and evaluating.
Analysing products, creating and using design criteria and evaluating prototypes and products based on the values of **User**, Materials, Function Aesthetics, User and **Size.** (elements of the Responsible Decision-Making Framework).

The '**Responsible Decision-Making Framework**' considers why the product exists and how well it does what it is supposed to do (user, function, aesthetics, materials, size and **safety**).

Analysing products, creating and using design criteria and evaluating prototypes and products based on the values of User, Materials, Function Aesthetics, User, Size and **Safety.** (elements of the Responsible Decision-Making Framework).

The 'Responsible Decision-Making Framework' considers the true cost of a product (environmental).

There is a growing focus on sustainable and 'responsible' design.

Making products and prototypes from recycled materials.

Analysing existing products using the 'Responsible Decision-Making Framework' to see if they meet design criteria and identify problems or improvements that could be made. Use design criteria based on the design values of **Environmental** (including Sustainability and the 6Rs) when designing. Evaluating products or prototypes based on User, Function, Aesthetics, Materials, Size, Safety and **Environment**.

To design in a more sustainable way, consider the 6 Rs: Reduce, Reuse, Refill, Repair, Recycle, Refuse.

Recycling means turning the materials from things we no longer want or need into new material that can be used to make new things.

Upcycling is where we re-purpose a product in a way that creates a new product of higher quality or value than the original.

A product's **life cycle** is the whole 'life' of the product, from its design, production, use and disposal.

Responsible design involves making choices that are complicated and difficult - there are many different conflicting factors and choices to be made.

Making 'better' (informed) material choices and decisions where it's appropriate to 'not' make things. Make products and prototypes by recycling materials to give them a new use.

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The **Design in the past, Present & Future** Vertical Concept is where pupils learn about design, how it has changed over time and how it will continue to evolve with the development of new technologies. This will be illustrated in each unit through introducing pupils to prominent people, companies, designs and inventions from the past and present. Pupils will apply this knowledge through:

Disciplinary Analysis of existing products, using existing products as inspiration and using traditional and digital tools when designing.

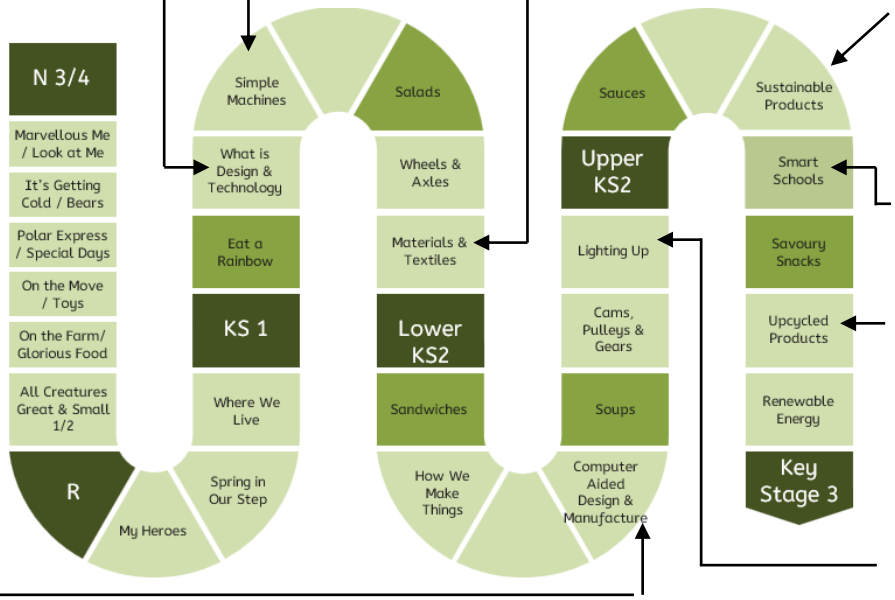
Explain how a simple existing product works.

Everything around us that is human-made has been designed by humans.

Design is when you create something new (or improve something) to help solve a problem or meet a need.

Analyse the **materials** and **function** of existing products by describing and identifying product features.

Use existing products as inspiration to generate ideas.



Analyse the materials, function and **aesthetics** of existing products by describing and identifying product features.

Why we design has changed: From pure functionality to considering sustainability, inclusivity, and social impact.

Analyse existing products using the 'Responsible Decision-Making Framework' to see if they meet design criteria and identify problems or improvements that could be made.

Analyse the materials, function, aesthetics, user, size, safety and **environmental** of existing products by describing and identifying product features, comparing products and identifying design criteria.

What we design has changed: From physical objects to services, systems, and experiences.

Design is the intentional act of creating solutions and systems that solve problems through planning, creativity, and decision making.

The digital revolution has enabled new forms of design across almost all industries, such as fashion, agriculture and architecture.

Design using traditional, and digital tools (like CAD and AI).

Analyse the materials, function, aesthetics, user, size and **safety** of existing products by describing and identifying product features, comparing products and identifying design criteria.

Use existing product analysis as a copy technique to generate ideas.

Design a solution that meets design criteria to improve an existing product.

Design has a rich and complex history stretching from early human tool-making through the industrial revolution to today's digital age.

Designs have changed over time, for example how phones evolved from early telephones to smartphones.

How we design has changed: From craft-based intuition to systematic methods and computer-aided tools.

User-centred design and human factors are new ways of thinking about design.

Analyse the materials, function, aesthetics, **user** and **size** of existing products by describing and identifying product features, comparing products and identifying design criteria.

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The **Designing** Vertical Concept gradually introduces different design values, the design process, ideation and design communication techniques such as sketching and CAD. Pupils will apply this knowledge through:

Procedural Using an increasing range of processes to add surface designs to products and prototypes.

Disciplinary Analysis of existing products and designing prototypes and products using increasing elements of the design process (design criteria, ideation, design development, prototyping, testing, evaluating and iterating) whilst considering an increasing range of design values.

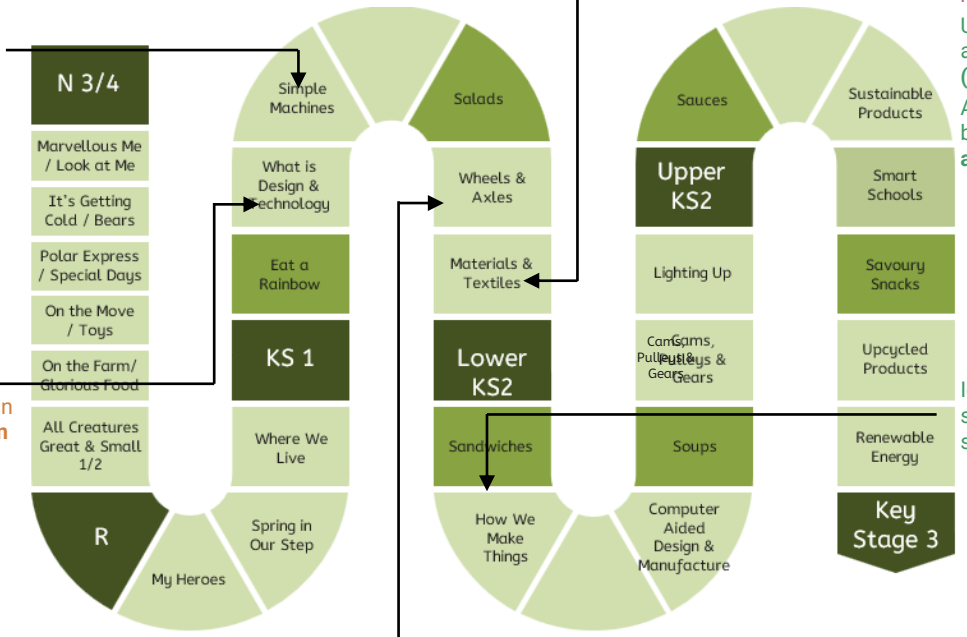
The design values of **materials** and **function** and why they are important.

Introduction to prototyping and testing as stages of the design process.

Develop design ideas by testing prototypes and suggesting improvements. Evaluate products and prototypes based on the values of **materials** and **function.**

Introduction to the design process including **Design Values** and **Design Criteria, Identifying a problem** and **Ideation** (using photographs and existing products as inspiration).

Use existing products, photographs and a group mind map as inspiration to generate ideas. Design a solution to a given problem that meets shared design criteria. Analyse products and use design criteria based on the values of **materials** and **function.**



The design value of **aesthetics** and why it is important.

Add surface designs by attaching decorations to materials.

Use CAD to design in 2D and move to 3D. Test the appearance and surface quality of a product **(visual testing).**

Analyse products, use design criteria and evaluate based on the values of materials, function and **aesthetics.**

Identify and analyse a range of freestanding structures for function - including strength, stability and type of structure (shell or frame).

Designing involves different steps including identifying a problem, generating ideas, **making, testing** and **evaluating** your designs.

A 2D sketch is a flat drawing that shows how something will look from just one side.

Add surface designs to paper and card using coloured pencils, pens, felt tips and markers.

Use chooser charts to generate ideas. Draw simple 2D sketches and add labels. Test a product or prototype to see if it works properly **(function testing).** Evaluate products and prototypes based on the values of **materials and function.**

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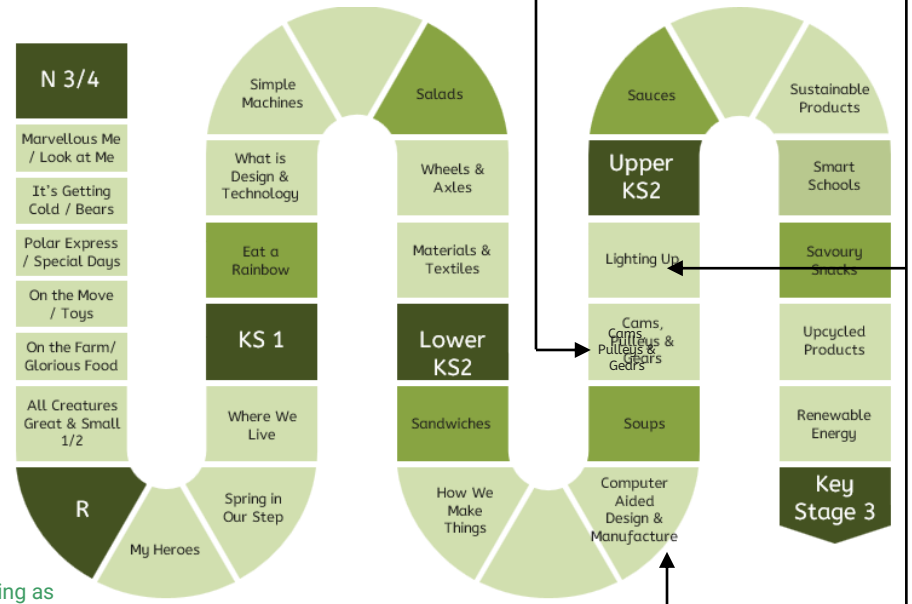
The design process is **iterative** and includes generating and developing ideas; evaluating; testing and **refining** (making improvements).

Create own design criteria based on the design values of materials, function, aesthetics, user and size when designing.

Design a simple mechanical system and explain how it functions.

Design using part, or all of a design process e.g. make > test > re-design



Use existing product analysis as a copy technique to generate ideas. Design a solution that meets design criteria to improve an existing product.

Accurately draw in cm using a ruler, add notes to sketches to describe main features. Draw cross-sectional and exploded diagrams and use CAD to create an exploded diagram.

Test designs with real users, watch how people use products, ask users what they like and don't like and discuss with others how an existing product can be improved. Evaluate by comparing two or more products or prototypes and explaining which one (or which features) you think works the 'best' and why.

Analyse products, create and use design criteria and evaluate prototypes and products based on the values of materials, function, aesthetics, user, size and **safety.**

The design value of **safety** and why it is important.

An **exploded diagram** shows all the parts of something floating apart like they've been pulled away from each other, so you can see exactly how they all fit together.

A **cross-sectional diagram** shows what something looks like if you cut it in half and look inside.

Define a problem based on analysis of a context.

Use sketching and/or modelling as a copy technique to generate ideas.

Accurately draw designs full size in 2D and add dimensions to sketches.

Develop design ideas by testing a prototype and making improvements to its design (iterating).

Use the basic functions of Computer Aided Design software for designing. Use CAD to design a new 3D shape by positioning, resizing, aligning and combining existing shapes and to create a 3D design of a single part or product that can be made using CAM (e.g. a 3D printer). Test a product to see if it is easy to use (user testing). Analyse products, create and use design criteria and evaluate prototypes and products based on the values of materials, function, aesthetics, user and size.

The design values of users and size and why they are important. Introduction to problem definition, design development and prototyping.

COPY-TRANSFORM-COMBINE is a framework you can use for ideation.

2D refers to flat designs with width and height only, 3D adds depth, creating objects with volume and perspective. 2D designs often serve as a planning tool before developing them into 3D forms.

Computer Aided Design (CAD) is the use of computer software to create digital designs.

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Procedural Using an increasing range of processes to add surface designs to products and prototypes.

Disciplinary Analysis of existing products and designing prototypes and products using increasing elements of the design process (design criteria, ideation, design development, prototyping, testing, evaluating and iterating) whilst considering an increasing range of design values.

Create and use Chooser Charts (morphological analysis) as a transform and combine technique to generate ideas.

The design value of **environmental** and why it is important.

Design Values help us to make responsible decisions and include why the product exists, how well the product does what it is supposed to do and what the environmental, economic, ethical and social cost of the product is.

Designers can design for self, for others, for groups.

Add surface designs by embroidering or using decorative stitching.

Analyse existing products using the 'Responsible Decision-Making Framework' to see if they meet design criteria and identify problems or improvements that could be made.

Re-design an everyday product to make it more sustainable. Design for themselves, for others, and for groups.

Evaluate products or prototypes by conducting user tests to gather detailed feedback and test a product prototype by comparing it to the design criteria.

Analyse products, create and use design criteria and evaluate prototypes and products based on the values of materials, function, aesthetics, user, size, safety and **environmental** (including **sustainability** and **the 6Rs**).

Use Crazy Eights as a transform and combine technique to generate ideas. Design using traditional, and digital tools (like CAD and AI) and draw simple three-dimensional sketches.

Create and use design criteria based on the values of materials, function, aesthetics, user, size, safety and environmental (including sustainability, the 6Rs and the **product lifecycle**).

Use CAD to create a 3D design of a single part or product with specific dimensions.

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The **Materials** Vertical Concept gradually introduces different materials (and their properties) to pupils. Pupils will apply this knowledge through:

Procedural Being able to select materials and use the different tools and processes to shape and form materials when making products and prototypes.

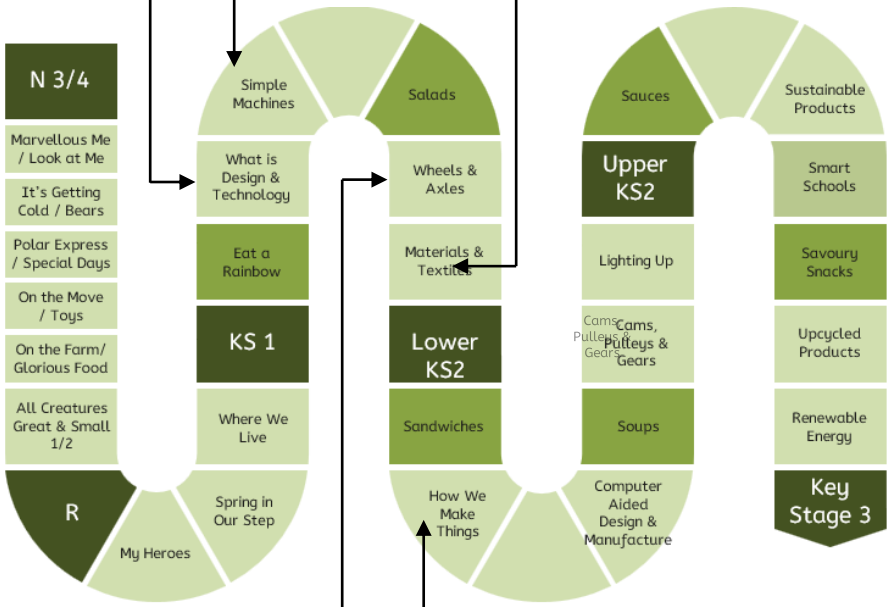
Disciplinary Considering material as a design value when analysing products, creating design criteria and evaluating prototypes and products.

Different materials (including different fabrics) have different properties that make them useful for making different objects. Paper and card are human-made materials that are made from wood pulp. They can also be made by recycling old paper and card.

Analyse the **materials** and **function** of existing products by describing and identifying product features.

Use shared design criteria based on the design values of **materials** and **function** when designing.

Paper and card are exceptionally good at being shaped, formed and layered.



Cotton, wool, linen and bamboo are all natural materials that can be used to make fabrics. Natural textiles are exceptionally good at producing fabrics that work well with the body as they are comfortable, flexible and strong. Felt is made from short fibres matted together and can be natural (using wool fibres) or human-made (using plastic fibres).

Select appropriate tools and processes for measuring, marking out, cutting, shaping, joining and finishing paper, card and textiles.

Wood is a natural material made from trees. It can be re-used or recycled into new products such as paper, cardboard and fibreboard.

Identify and select appropriate materials for different purposes based on their properties. Select appropriate tools and processes for measuring, marking out, cutting, shaping, joining and finishing paper and card.

Evaluate products or prototypes based on materials and function.

Wood is exceptionally good at supporting a load and being shaped. Concrete and steel are excellent 'all-round' materials so are often used as construction materials for structures like bridges and buildings.

Select appropriate tools and processes for measuring, marking out, cutting, shaping, joining and finishing paper, card, textiles and wood.

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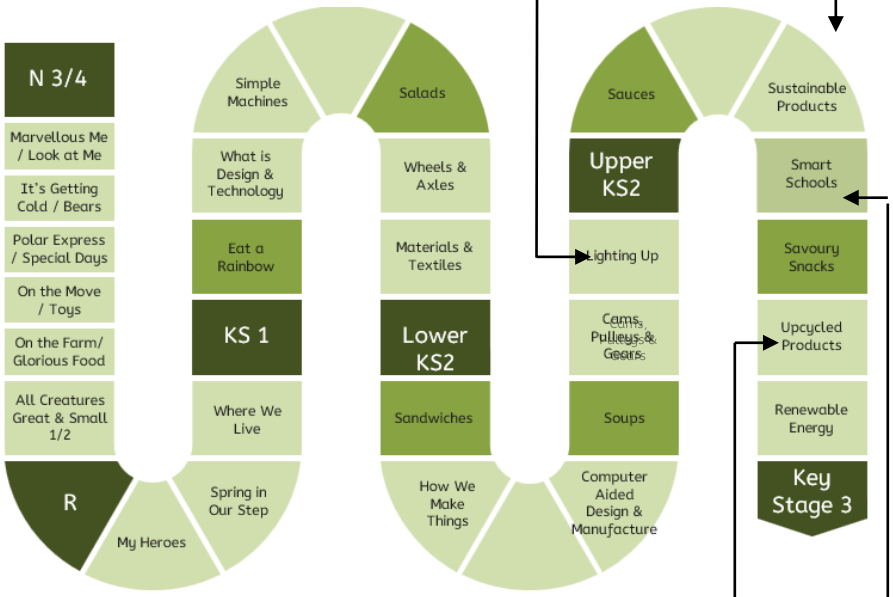
Metals are natural materials mined from the ground; most metals can be recycled into new products. Metals excel at providing strength and durability while conducting heat and electricity.

Copper is a good example of a highly conductive metal; it is used for electronic circuits and wires.

Aluminium is the most sustainable metal; it is lightweight and is easy to re-use and recycle.

Select appropriate tools for cutting paper, card, textiles, wood and metal (aluminium foil, wire and copper tape).



The properties of materials are important when designing and making different products. All materials are a compromise of different factors such as properties, cost, sustainability.

Plastics are human-made materials made from oil. Many plastics can be recycled to produce more plastic. Polyester, acrylic and nylon are types of human-made plastics that can be used to make fabrics.

Compare different materials against a variety of criteria to make informed material selections.

Identify and select appropriate materials for different purposes based on their properties, design criteria and user wants and needs.

Plastics are human-made materials made from oil; many plastics can be recycled to produce more plastic.

Bio plastics are made from plants (like corn, potato, seaweed) instead of oil. They are better for the environment because they break down naturally and don't leave harmful plastic waste behind.

Make 'better' (informed) material choices.

Explain why specific materials have been selected.

Select appropriate tools and processes for shaping and joining paper, card, textiles, wood and metal (aluminium foil, wire and copper tape).

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The **Making** Vertical Concept introduces the making process, safety when making and the different manufacturing methods (used to shape materials) to pupils. Pupils will apply this knowledge through:

Procedural Being able to select materials and safely use the different tools and processes to shape and form materials when making products and prototypes. Use the making process (measure, mark, cut, shape, refine, join, finish) to make products using an increasing range of materials, tools, components and processes to make products and prototypes that increase in complexity.

We must listen to and follow safety instructions.

We need to keep our work area tidy to stay safe.

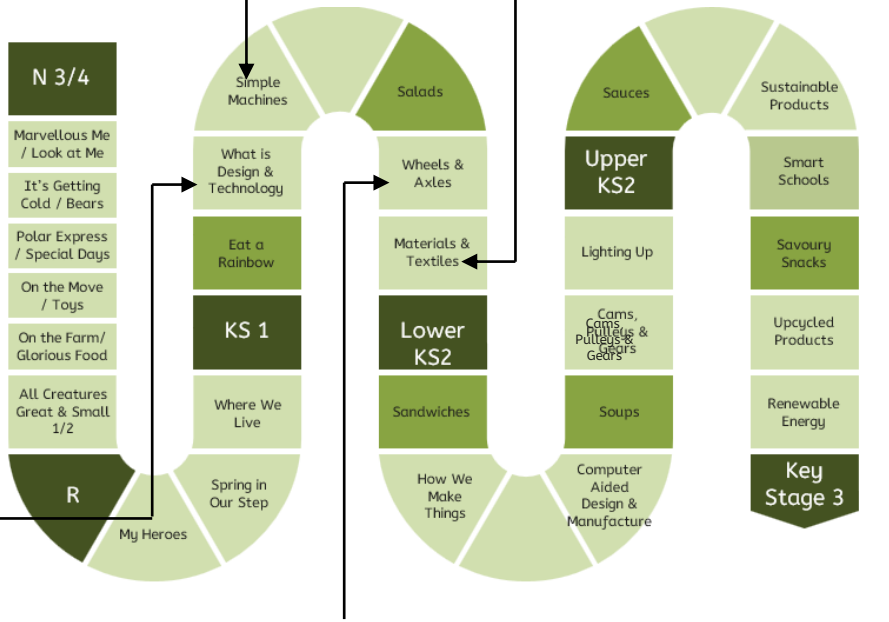
There is a basic making process: this includes **measuring, marking, cutting** (or adding) materials and **assembling.**

Work safely when using different hand tools such as scissors.

Measure using a 1cm grid, mark out and cut straight lengths and curved shapes using scissors and holes using a pencil and blue tac. Join paper and card using glue and split pins and add surface designs.

Make simple slider, lever and linkage mechanisms

Make a grabber.



There is a basic making process: this includes measuring, marking, cutting (or adding) materials, assembling and **finishing.**

Work safely when using different hand tools such as scissors and needles.

Select appropriate tools and processes for measuring, marking out, cutting, shaping, joining and finishing paper, card and textiles.

Thread a needle and tie knots.

Mark out materials and fabrics using paper templates (patterns) and tailors' chalk. Join paper, card and fabrics using paperclips, Velcro, running stitch and glue and add surface designs by attaching decorations to materials.

Make a re-usable heat pack.

Roll and fold paper, join paper and card using tape. Shape plasticine (or air-dry clay) and craft materials such as pipe cleaners and art straws.

Build a strong and stable freestanding structure from paper, card and craft materials.

Make a playground equipment model.

Tools can be dangerous if not used correctly, different tools have specific safe ways to be used and some need adult supervision.

We must wear safety equipment when told to.

Identify and select appropriate materials for different purposes based on their properties.

Select appropriate tools and processes for measuring, marking out, cutting, shaping, joining and finishing paper and card.

Measure and mark out lengths using a ruler (cm). Cut holes using a hole punch. Shape (by folding and gluing) and add surface designs to paper and card.

Make vehicle models with free and fixed axles and using waste materials.

Make a vehicle model.

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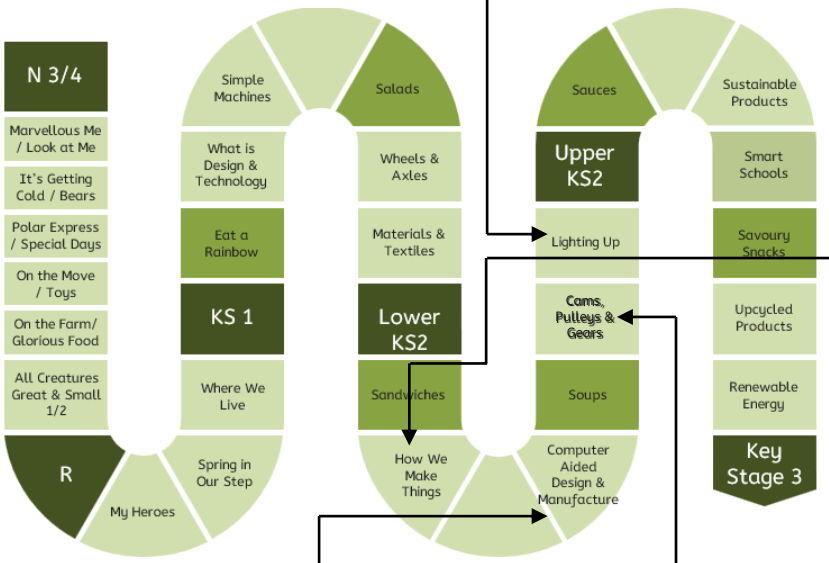
Conduct a simple risk assessment for using a tool, machine or product.

Select appropriate tools for cutting paper, card, textiles, wood and metal (aluminium foil, wire and copper tape).

Join components to make a circuit using copper tape and make a simple switch.

Make and test a functioning circuit where an output device responds to a switch.

Make a mini LED torch.



Computer Aided Manufacturing (CAM) is when a machine, for example, a 3D printer, is programmed to make a product or part from a CAD design.

Materials can be shaped by extruding and by building up layers of materials (additive manufacturing), for example, by laminating or 3D printing.

Conduct a simple risk assessment for using a tool or machine.

Shape materials by additive manufacturing (3D printing).

Make a 3D printed zip pull.

Make simple cam, pulley and gear mechanism models.

Make a functioning prototype containing a mechanical system – A pulley system to transport a load down a steep incline.

We can reduce risk through proper behaviour and procedures. Safe working practices include preparation and cleanup.

Personal protective equipment (PPE) protects specific body parts, examples include aprons, goggles and oven gloves.

Tools have specific hazards we need to understand; some tools require training before use. Different materials can also require different safety approaches.

Emergency procedures exist for different situations.

Materials can be shaped by folding; by building up layers of materials, for example by laminating; by removing from a block of material (subtractive manufacturing); by forming or by casting.

Conduct a simple risk assessment for using a tool and work safely when using different hand tools such as scissors and saws.

Select appropriate tools and processes for measuring, marking out, cutting, shaping, joining and finishing paper, card, textiles and wood.

Measure and mark out lengths using a ruler and 90 degree angles using a set square. Cut straight lengths using a junior hacksaw. Join paper, card and wood using tape and glue. Edge finish by sanding. Shape materials by forming (by hand and into a mould) and by casting (into a mould).

Make paper bridges, wooden frame structures (for a bug box or hedgehog hotel), formed models, chocolate boxes and chocolates.

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In industry, 3D printers are often used to make quick prototypes of products directly from 3D CAD designs to test their form or function.

Make products and prototypes by recycling materials to give them a new use - A pop bottle product.

There is a basic making process: this includes measuring, marking, cutting (or adding) materials, refining, assembling and finishing.

Work safely when using different hand tools such as scissors, saws and needles.

Draw a pattern or template to the correct size (in mm) on paper and mark out fabrics to include a seam allowance. Join materials using pins, safety pins, fasteners, overstitch and backstitch. Add surface designs by embroidering or using decorative stitching. Edge finish by hemming.

Make products and prototypes from recycled materials.

Make a re-usable sandwich wrap or pouch.

Select appropriate tools and processes for refining and finishing paper, card, textiles, wood and metal (aluminium foil, wire and copper tape).

Experiment with free standing structures using different techniques to make them more stable.

Join components and materials using copper tape, crocodile clips, connectors and by splicing (e.g. twisting wire).

Make a functioning prototype containing an electro-mechanical system - A wind turbine tower and a functioning wind turbine that will generate electricity.

Select appropriate tools and processes for shaping and joining paper, card, textiles, wood and metal (aluminium foil, wire and copper tape).

Select and use input and output components in a circuit.

Make simple programmes for a microcontroller that will turn output components on and off, on and off in a repeating pattern and that will control output components depending upon different input conditions.

Join like and different components and materials to make a circuit using copper tape and crocodile clips.

Make a functioning prototype containing an electrical system - a model school with functioning electrical control systems.

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The **Structures** Vertical Concept introduces different types of structures and how they can be made stronger and more stable to pupils. Pupils will apply this knowledge through:

Procedural Being able to make strong and stable frame and shell structures for products and prototypes that increase in complexity.

Disciplinary Analysis of structures for strength and stability and designing structural prototypes and products that increase in complexity.

2D shapes have a length and width, whereas 3D shapes have a length, width and height.

Free-standing structures can be made **stronger** with stiffer materials, thicker materials, by folding materials or with more layers of material (laminating).

Free-standing structures can be made more **stable** by having a wider or heavier base.

Roll and fold paper to make 3D shapes that can support a weight.

Build a strong and stable freestanding structure from paper, card and craft materials.

Make a playground equipment model.

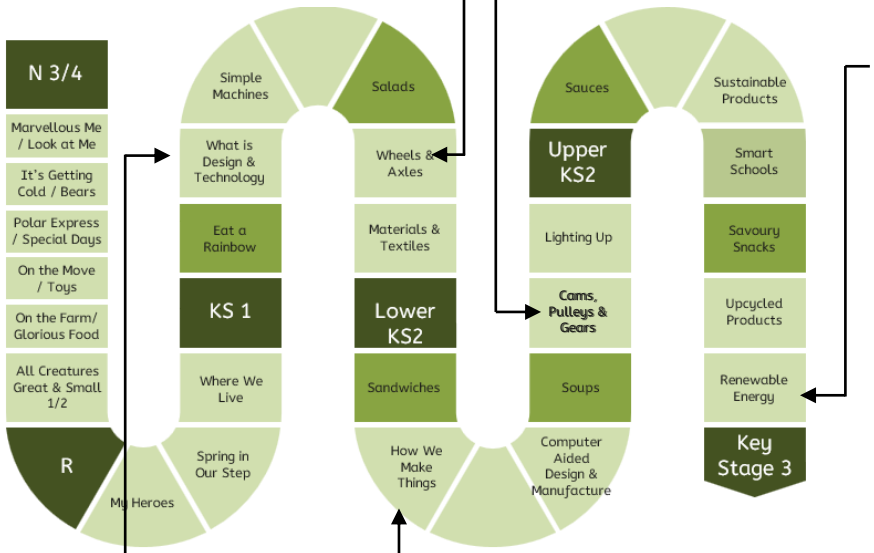
Identify and analyse a range of freestanding structures for function - including strength and stability.

Design a solution to solve a given problem that meets shared design criteria.

Design a playground equipment model.

Make a vehicle model using waste materials.

Design a vehicle model using waste materials.



Make a functioning prototype containing a mechanical system - A pulley system to transport a load down a steep incline.

Design a pulley system to transport a load down a steep incline.

Free-standing structures can be made more stable by adding stands, ties or buttresses.

Make a functioning prototype containing an electro-mechanical system - a wind turbine tower.

Design a wind turbine tower.

Triangulation makes structures and joints stronger and more stable.

A **shell structure** has a continuous outer 'shell' and does not have a frame, like an eggshell or a dome in a building.

A **frame structure** is made from separate pieces of material called members that form a frame, like climbing frames or houses.

Make 3D shell structures by folding 2D nets from paper or card.

Make frame structures by joining lengths of materials.

Strengthen structures and joints using triangulation.

Shape materials by forming (by hand and into a mould) and by casting (into a mould).

Make paper bridges, wooden frame structures (for a bug box or hedgehog hotel), formed models and chocolate boxes.

Design paper bridges, wooden frame structures (for a bug box or hedgehog hotel), formed models, chocolate boxes and chocolates.

Progression in Design & Technology

Vertical Concepts
Responsibility
Design in the Past, Present & Future
Designing
Materials
Making
Structures
Mechanical Systems
Electrical Systems

Procedural
Tools, Materials & Components
Processes

Disciplinary
Product Analysis
Design Values & Criteria
Designing
Design Communication
Evaluating

The **Mechanical Systems** Vertical Concept gradually introduces different types of mechanisms and how they can be used in mechanical systems. Pupils will apply this knowledge through:

Procedural Being able to make functioning mechanisms for products and prototypes that increase in complexity.

Disciplinary Designing mechanical and electro-mechanical prototypes and products that increase in complexity, explaining their function.

A machine is something that does work for us to help us do things more easily. For example, scissors help us to cut materials easier and vacuum cleaners help us to clean the floor.

A mechanism is a single part of a machine. Mechanisms make changes to movement or make movement easier.

There are different types of movement. These include linear, reciprocating and oscillating movement.

A slider is a simple mechanism. It is a rigid beam that moves back and forth on a straight line. For example, drawers, sliding doors and extending ladders.

A lever is a simple mechanism. It is a rigid beam that pivots (turns), like door handles, see-saws, scissors and windscreen wipers.

A linkage mechanism is a system of levers that are joined together to control movement, for example umbrellas, scissor lifters, tool-boxes and camping chairs.

Make simple slider, lever and linkage mechanisms.

Make a grabber.

Explain how a simple existing product works (products that contain sliders and levers).

A wheel is a round part that turns on a stick called an axle. It is a mechanism that makes it easier to move things.

Wheeled vehicles have different parts including the body, wheels, axles, axle holders and a chassis.

There are different types of movement, including linear, reciprocating, oscillating and rotary movement.

There are two types of axle: fixed and free. Fixed axles attach to the chassis and can not rotate.
Free axles are not attached to the chassis and can rotate within the chassis.

Make vehicle models with free and fixed axles.

Make a vehicle model.

Design a vehicle model.

Progression in Design & Technology

- Vertical Concepts
- Responsibility
- Design in the Past, Present & Future
- Designing
- Materials
- Making
- Structures
- **Mechanical Systems**
- Electrical Systems
- **Procedural**
- Tools, Materials & Components
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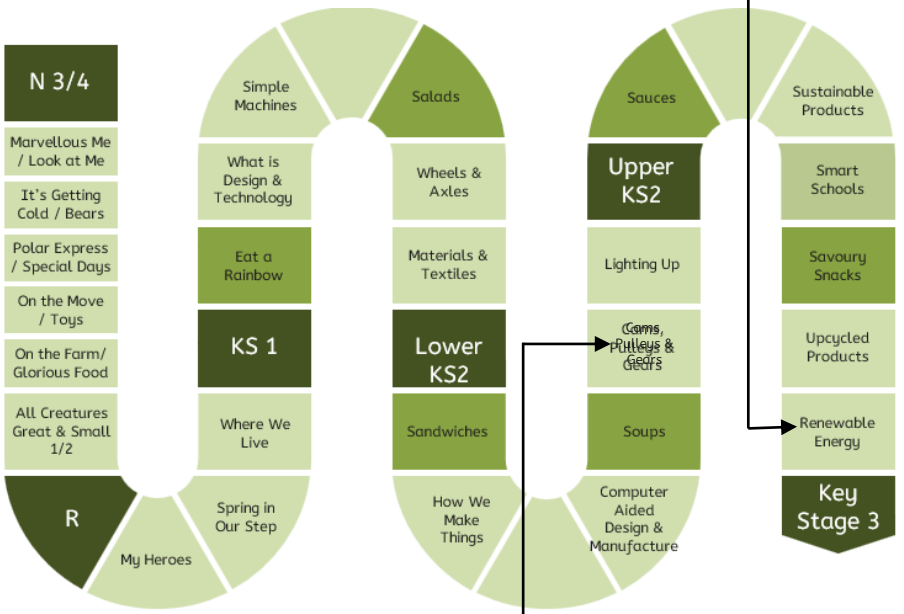
Connecting different-sized gears will change the output speed of a shaft by making it spin faster or slower than the input shaft.

Make a functioning prototype containing an electro-mechanical system – a wind turbine.

Design an electro-mechanical system – a wind turbine.

Write a detailed description of how a more complex electro-mechanical system works.



Make simple cam, pulley and gear mechanism models.

Make a functioning prototype containing a mechanical system – A pulley system to transport a load down a steep incline.

Design a simple mechanical system and explain how it functions – A pulley system to transport a load down a steep incline.

A component is a standard mechanical or electrical part.

(Mechanical) systems have an input, a process and an output. They use mechanisms (the process) to change an input movement (or force) to an output movement (or force).

Mechanisms are components in a mechanical system that change the input movement (or force) to the output movement (or force).

A cam is a simple mechanism that changes rotary motion to reciprocating motion. It is a shaped wheel that pushes a stick (called a follower) up and down as it rotates. Examples of cams are in the pop-up mechanism of a mechanical toy or a toaster.

Different-shaped cams produce different follower movements.

A pulley is a simple mechanism. It is a grooved wheel that spins on an axle, with a rope around it that helps to lift or move heavy things more easily. Pulleys are used on flagpoles for raising flags, for lifting heavy objects on cranes and in elevators.

A drive belt can connect two pulleys and transfers movement from one pulley to another. Pulleys and drive belts are used in window blinds and cable cars.

A gear is a simple mechanism. It is a wheel with teeth that connects with other gears to help machines move. Gears can make things move more easily or can be used to change the speed (or direction) of movement. Examples of gears include bicycle gears that make it easier to pedal up hills.

A machine is a collection of mechanisms that helps people do work more easily.

Progression in Design & Technology

- Vertical Concepts
- Responsibility
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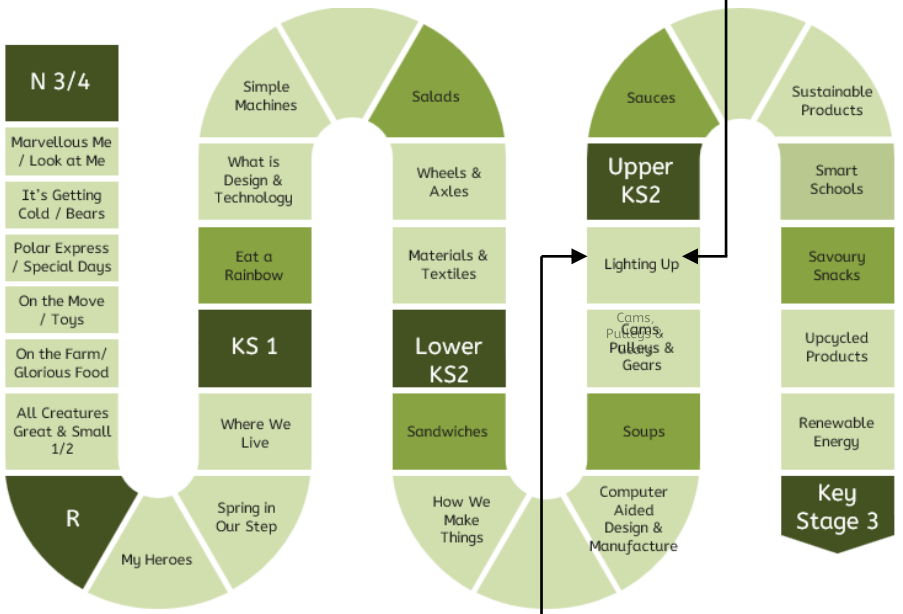
The **Electrical Systems** Vertical Concept gradually introduces different electronic components including microcontrollers and how they can be used in electrical systems. Pupils will apply this knowledge through:

Procedural Being able to select electrical and electronic components and make (and programme) electrical circuits and control systems for prototypes and products that increase in complexity.

Disciplinary Designing (and programming) electrical and electro-mechanical prototypes and products that increase in complexity, explaining their function.



Make a simple switch.

Make and test a functioning circuit where an output device responds to a switch.

Make a mini LED torch.

Use CAD to design, simulate and modify a simple electrical circuit, create and simulate circuits containing switches and different output devices.

Design a mini LED torch.

A cell contains chemicals that react to provide an electrical power supply (electrical energy).

A battery is made from multiple cells and provides more electrical power than a single cell.

Batteries and cells have an anode (positive side) and a cathode (negative side).

Switches can be used as input components as they can connect and disconnect the electrical power supply to different parts of a circuit.

Output devices are components that produce something in an electrical circuit such as a lamp that lights up or a buzzer that makes a sound.

An LED is a type of light often used as an output component that uses very little electrical power and is available in different colours.

LEDs have an anode leg and a cathode leg; they need to be connected the right way round in a circuit to work.

Circuits are made by using conducting materials (e.g. metal, wire) to join electronic components together.

Progression in Design & Technology

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Disciplinary Designing (and programming) electrical and electro-mechanical prototypes and products that increase in complexity, explaining their function.

Select and use an appropriate input component (switch and/or sensor) in a circuit.

Select and use an appropriate output component in a circuit.

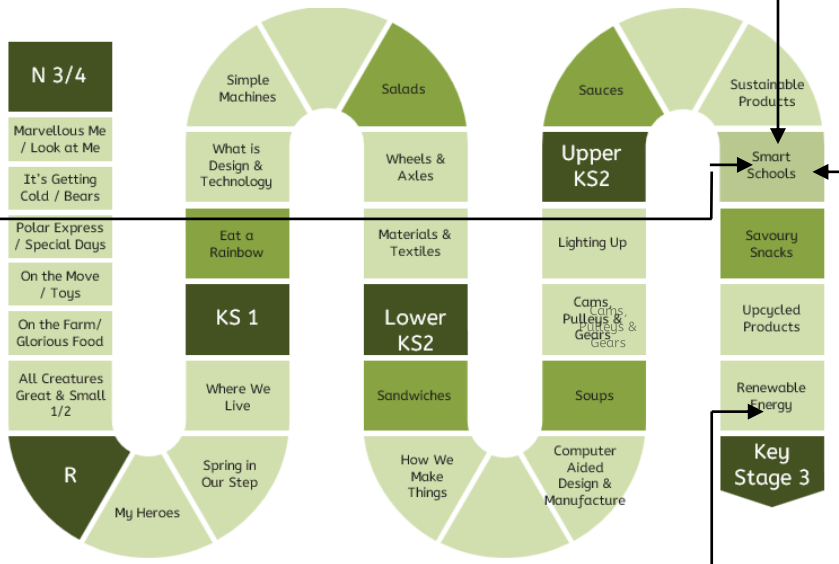
Make simple programmes for a microcontroller that will turn output components on and off in a repeating pattern and that will control output components depending upon different input conditions.

Join like and different components and materials to make a circuit using copper tape and crocodile clips.

Make a functioning prototype containing an electrical system - a model 'smart' school with functioning electrical control systems.

Use CAD to design, programme and simulate an electrical control circuit containing a microprocessor. Design simple block diagrams to communicate inputs, process and outputs of a simple monitoring and control (system).

Design a model 'smart' school with functioning electrical control systems.



Electronic systems have inputs, processes and outputs.

Microcontrollers (such as a Micro:bit or a Crumble) are process devices that can be programmed to respond to changes to inputs and control output devices.

Speakers are output components that produce sounds.

Motors are components often used as output devices that turn electrical power into rotational movement by spinning a shaft. A servo motor is a small motor that can move things to a specific position.

An electronic input device, like a switch or sensor, is something that helps a machine know when to turn on or off, or when something is happening.

A pressure switch is a switch that connects (or disconnects) when pressed. A tilt switch is a switch the connects (or disconnects) when it is tilted. A reed switch is a magnetic switch that connects when a magnet is close to it.

A sensor is an input component that helps a machine know when something in the environment changes, like light level, temperature, sound or movement.

Light sensors (LDRs) detect changes in light levels. Sound sensors detect sound and changes in noise levels. Temperature sensors detect changes in temperature levels.

Solar cells are devices that convert sunlight to electricity. A solar panel is made up of lots of solar cells.

Wind turbines are machines that convert wind power to electricity.

Motors can be used to generate electricity by spinning the shaft.

Make a functioning prototype containing an electro-mechanical system – a wind turbine.

Design an electro-mechanical system – a wind turbine.

Write a detailed description of how a more complex electro-mechanical system works.

Progression in Food

Vertical Concepts

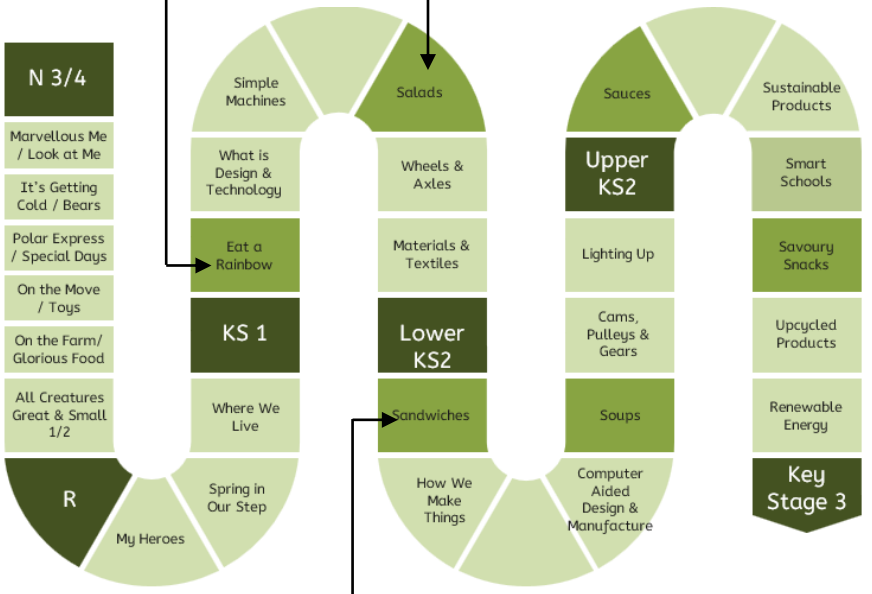
- Ingredients
- Nutrition
- Safety
- Food Hygiene

- Procedural
- Processes
- Safety
- Food Hygiene

- Disciplinary
- Making Food Choices

The **Ingredients** Vertical Concept introduces an increasing range of ingredients from different sources to pupils so that they learn where different foods come from and the extent to which they are processed. Pupils will apply this knowledge through:

Procedural Being able to prepare, combine, assemble and cook using a range of ingredients and follow recipes safely and hygienically.
Disciplinary Being able to make healthy, sustainable and appropriate food choices in an increasing range of scenarios, selecting from an increasing range of ingredients.



Fruits and vegetables come from plants (including trees).
Fruits contain a plant's seeds. Vegetables are other parts of the plant.
Food can come from farms, allotments and gardens.
Fruits and vegetables are usually harvested in a particular season. Different foods are in season at different times of the year.
Chop a range of foods, including bananas, strawberries, grapes, cucumber or courgette, carrots and prepared apples or pears, pineapple or melon, peppers and celery. Peel bananas and satsumas.
Mash with a fork and mix with a spoon.
Follow simple recipes.
Wash up items by removing excess food, washing, rinsing and drying.
Make food choices based on colour and quantity of sugar.

Bread is made from flour, which is ground seeds of the wheat plant.
Sources of meat include chicken, sheep (lamb), pigs (pork products), tuna and other fish.
Make food choices based on colour; quantities of sugar, fat, and salt; dietary requirements; knowledge of food allergies.

Chop an increasingly complex selection of foods (e.g. hard-boiled eggs).
Peel hard-boiled eggs.
Stir with a teaspoon or tablespoon.
Spread butter/ margarine with a knife.
Use a hob to boil (an egg).
Independently maintain a clean and organised workspace.

Foods come from a range of sources, including plants (fruits and vegetables) and animals (meat and dairy products).
Milk comes from animals such as cows, sheep, and goats and plants such as almonds, soybeans and coconuts.
Foods made from animal milks are called dairy products.
Some foods are eaten as they are (e.g. milk; fruits and vegetables). Some foods are processed in some way before we eat them (e.g. cheese is made from milk).
Vegetarians do not eat animal meat. Vegans do not eat any animal product; they eat milks and cheeses made from plants (responsibility).
Remove the outer leaves of lettuce and wash and drain them.
Use a colander or sieve to drain canned foods.
Chop more accurately using the claw and bridge technique.
Chop a wider range of foods, including lettuce, salad onions, tomatoes, cabbage, tinned peaches, tinned pineapple, feta, mozzarella and prepared cheddar.
Peel and grate carrots.
Dress salad using two utensils and layer food on a salad bed.
Assemble salads with growing confidence.
Make food choices based on colour and quantity of sugar, plus quantities of fat and salt, and dietary requirements (vegans and vegetarians).

Progression in Food

Vertical Concepts
- Ingredients
- Nutrition
- Safety
- Food Hygiene

Procedural
- Processes
- Safety
- Food Hygiene

Disciplinary
- Making Food Choices

The **Ingredients** Vertical Concept introduces an increasing range of ingredients from different sources to pupils so that they learn where different foods come from and the extent to which they are processed. Pupils will apply this knowledge through:

Procedural Being able to prepare, combine, assemble and cook using a range of ingredients and follow recipes safely and hygienically.
Disciplinary Being able to make healthy, sustainable and appropriate food choices in an increasing range of scenarios, selecting from an increasing range of ingredients.

Sauce is a liquid or semi-liquid mixture served with food to add flavour, moisture, texture and colour.

Pasta is made from wheat flour and water (and sometimes egg). Couscous is a type of pasta.

Measure mass in grams and kilograms using a balance.

Chop a range of foods, including onions and cauliflower.

Use a tin opener.

Know when to use estimation.

Use a hob to boil pasta and a kettle to prepare couscous.

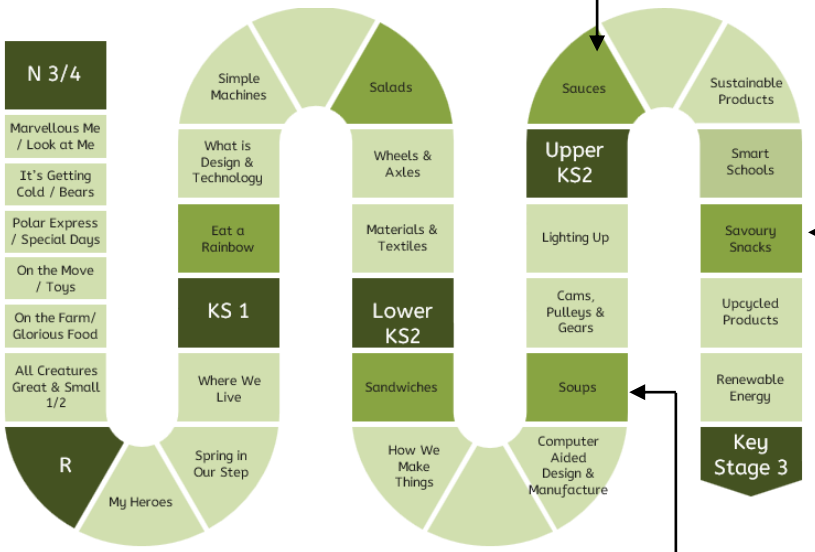
Combine a wider range of ingredients with increased confidence.

Make a roux and whisk ingredients to make a Bechamel sauce.

Make food choices based on colour; quantities of sugar, fat, and salt; dietary requirements; knowledge of food allergies; food miles; time taken to prepare.

Use constraints (cooking ingredients).

Evaluate foods based on colour; quantities of fat and salt; dietary requirements; knowledge of food allergies; food miles; time taken to prepare.



Foods can be minimally processed (like fresh fruit and vegetables); moderately processed (like cheese and flour); significantly processed (like baked beans); or ultra-processed (like ready meals; sugary cereals and crisps).

Crack eggs.

Rub flour into butter.

Shape and cut using cutters.

Use an oven to bake food.

Make food choices based on colour; quantities of sugar, fat, and salt; dietary requirements; knowledge of food allergies; food miles; time taken to prepare; carbon footprint of production and transport; occasion; and cost.

Beans and lentils are edible seeds from plants.

Seasoning adds to the taste of food. Seasoning can include salt, spices (like pepper), herbs, and sugar.

Spices are usually made from the seeds, roots, stem or fruits of a plant and add flavour to food.

Herbs are usually the leaves of a plant and add flavour to food.

Mushrooms are neither plants nor animals. They are a type of fungus.

Chop (dice) foods into smaller pieces (e.g. carrots, celery).

Crush garlic.

Measure volumes in millilitres and litres using a measuring jug.

Use a food processor or hand mixer.

Use a hob to sauté and simmer food, and to boil (vegetables).

Wash up items in the most appropriate order, starting with least dirty, and change washing up water as required..

Make food choices based on colour; quantities of sugar, fat, and salt; dietary requirements; knowledge of food allergies; food miles.

Progression in Food

Vertical Concepts
- Ingredients
- **Nutrition**
- Safety
- Food Hygiene

Procedural
- Processes
- Safety
- Food Hygiene

Disciplinary
- Making Food Choices

The **Nutrition** Vertical Concept introduces nutrition and the principles of a healthy and varied diet to pupils including dietary requirements and restrictions. Pupils will apply this knowledge through:

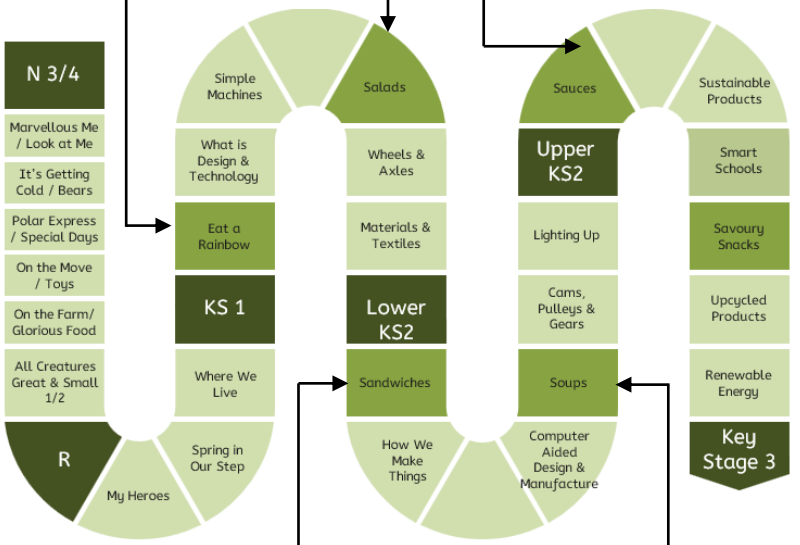
Disciplinary Being able to make healthy food choices and design healthy recipes and nutritionally balanced meals taking into account an increasing range of dietary requirements.

We should eat 5 portions of fruit or vegetables each day.

'Eating a rainbow' means to eat different types of fruits and vegetables, that might have lots of different colours.

Fruits and vegetables both contain lots of good things for our bodies. Fruits contain more sugar, so we should eat less of them.

Make food choices based on colour and quantity of sugar.



Apply the principles of a healthy and varied diet.

Some foods are sweet, and some are salty.

Texture is about how food feels in our mouths. Food textures include hard, soft, rough, smooth, crunchy, crispy, chewy, creamy.

Some foods have different textures when they are prepared in different ways.

Food is more interesting to eat if it has more than one texture at a time.

Make food choices based on colour and quantity of sugar, plus quantities of fat and salt, and dietary requirements (vegans and vegetarians).

A healthy diet is made up of mostly minimally and moderately processed foods. Too many ultra-processed foods should be avoided.

Some people are allergic to certain types of food, like nuts or gluten. This means their body reacts when they eat or are in contact with these foods. Some food allergies are mild, and some can be very serious.

Make food choices based on colour; quantities of sugar, fat, and salt; dietary requirements; plus knowledge of food allergies.

Some people are intolerant to certain types of food, like gluten or dairy products. This means their bodies cannot digest the foods. It can cause discomfort.

Progression in Food

Vertical Concepts
Ingredients
Nutrition
Safety
Food Hygiene

Procedural
Processes
Safety
Food Hygiene

Disciplinary
Making Food Choices

The **Safety** Vertical Concept introduces the principles of food safety to pupils. Pupils will apply this knowledge through:

Procedural Being able to prepare, combine, assemble and cook using a range of ingredients and follow recipes safely.
Disciplinary Being able to make food choices that are safe to eat, taking food allergies into account.

Chop using the 'claw and bridge' technique.

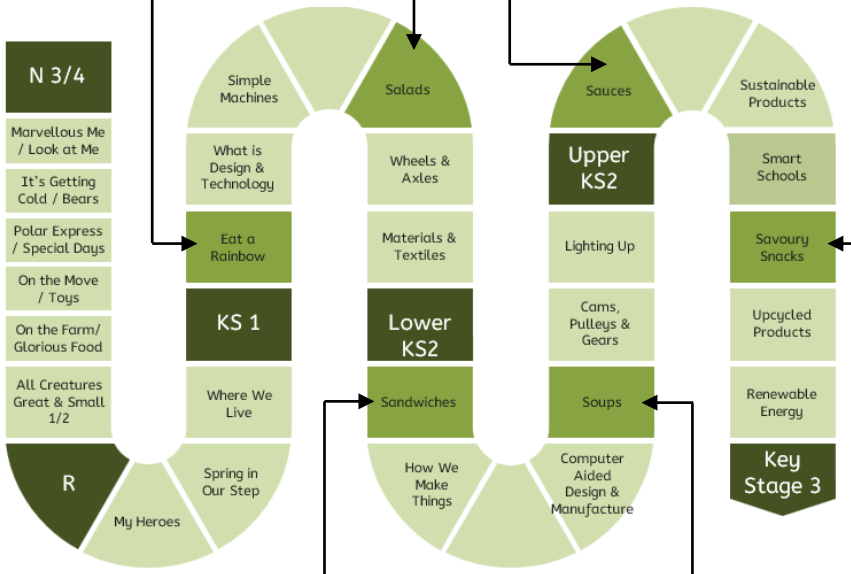
Use senses (sight, smell and touch) to check foods for any bits that should not be eaten.

Cooked pasta and couscous are high-risk foods and should be eaten immediately or kept in the fridge.

Use a material that is a poor thermal conductor (thermal insulator) when stirring hot food or removing food from the oven.

Use a hob to boil pasta.

Use a kettle to prepare couscous.



Use an oven to bake food.

Food should not be eaten after the 'use by' date. Foods can be eaten after the 'best before' date, but we should check them first.

High risk foods with a 'use by' date should be kept in the fridge.

Cheese, cooked meats and eggs are high-risk foods.

Consider the importance of the refrigerator for food safety.

Make food choices based on colour; quantities of sugar, fat, and salt; dietary requirements; knowledge of food allergies.

Hobs and hand blenders need to be used with care, keeping our fingers away.

When blending hot liquids, the blender lid should be on and/or it is kept well away from the user.

Use a food processor or hand mixer.

Use a hob to sauté and simmer food, and to boil (vegetables).

Progression in Food

- Vertical Concepts
- Ingredients
- Nutrition
- Safety
- Food Hygiene
- Procedural
- Processes
- Safety
- Food Hygiene
- Disciplinary
- Making Food Choices

The **Food Hygiene** Vertical Concept introduces pupils to the principles of food hygiene including how to limit the spread and growth of bacteria on food. Pupils will apply this knowledge through:

Procedural Being able to store, prepare and cook food in a way that limits the spread and growth of bacteria on food and to effectively clean food preparation areas and equipment.

Wash hands and tie hair back to stop the tiny living things on our hands getting onto the food and into our bodies.

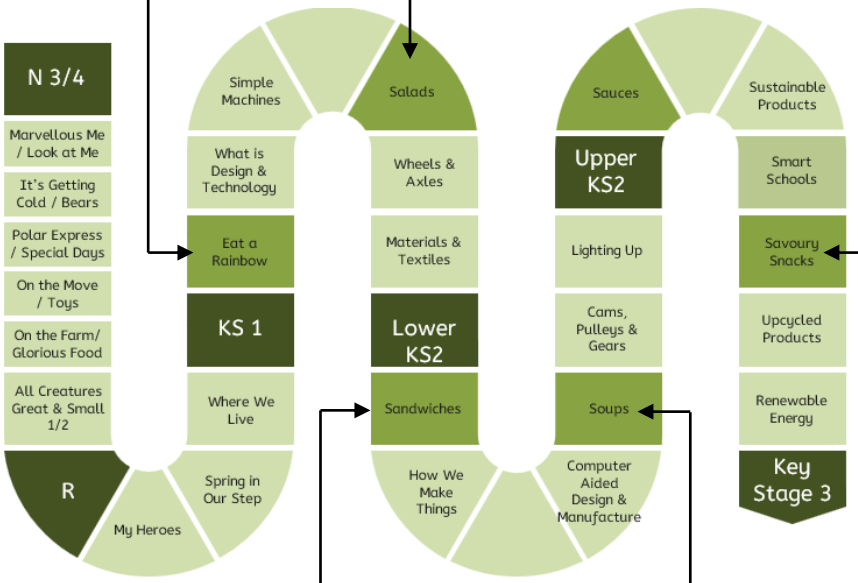
Wear an apron to protect our clothes and stop the tiny living things on them getting into food and into our bodies.

Wash and drain fruits.

Wash up items by removing excess food, washing, rinsing and drying.

Tie hair back and wash hands after sneezing, coughing and going to the toilet to stop the tiny living things on our hands getting into our bodies.

Remove the outer leaves of lettuce and wash and drain them.



The tiny living things that we need to stop getting into food are bacteria and viruses. They can sometimes make us unwell.

Hands should be washed after handling raw eggs to stop the tiny things living in there getting into our bodies, because they can make us unwell.

Independently maintain a clean and organised workspace.

Food preparation sources should be wiped down before and after use to stop the tiny living things on the surfaces getting onto food.

Food preparation areas should be left clean so that food pests are not attracted.

Wash up items in the most appropriate order, starting with least dirty, and change washing up water as required.