Fairlawn

Engineer Curriculum Design and Technology V3 2023-24

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Term 1			• Structures • Bridge Building			• Shell Structures • Trade Game	
Term 2		• Glove Puppet • Textiles • Templates and joining techniques	• Sandwiches & Wraps • Food • Healthy and Varied Diet				
Term 3				• Moving Scene • Mechanical Systems • Levers and Linkages • Pushes and Pulls	• Electrical Systems • Simple Switcbes and Cicuits • Paper Cicuit Greeting Card		• Industrial Revolution • Mechanical System • Cams
Term 4			• Building Playground equipment • Structures • Freestanding Structures	• Pennant • Textiles • 2D Shape to 3D product	• Ocean Creature • Textiles • 2D Shape to 3D shape	• Biome scene • Textiles • Combining different fabric shapes • Aly Dalrymple	
Term 5		• Fruit and Vegetable Kebab • Food • Preparing Fruit and Vegetables • Moving Transport poster • Mechanisms • Sliders and Levers			• Pizza • Food • Healthy and Varied Diet	• Vehicles • Mechanical Systems • Pulleys and Gears • Biscuits • Food • Celebrating Culture and seasonality	
Term 6			• Land Vehicle • Mechanisms • Wheels and Axles	• Savoury Muffin • Food • Healthy and Varied Diet	• Structures • Shell Structures • Packaging Design	• Birdhouse • Structures • Frame Structures	• Scones • Food • Celebratiing Culture and Seasonality • Car alarm • Electrical Systems • More Complex Swithces and Systems

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Cookery		• I know that vegetables are plants, • I know that vegetables are grown on farms, allotments gardens • I know that vegetables need preparation before cooking. • I can peel and chop carrots into **carrot sticks**	• I know that food is 'grown', 'harvested' and 'prepared' • I can name some places this process happens locally • I know what the term 'balanced diet' means. • I know what 'fresh' food means. • I can follow a recipe • I can peel , chop blend and simmer a range of vegetables • I can prepare a **vegetable soup**	• I know what makes a diet 'healthy' and balanced' • I know what 'seasonality' means • I can follow a basic muffin recipe • I can adapt the recipe based in design criteria of a healthy diet i.e replacing fats, less sugar, less salt, adding fresh fruit or vegetables • I can weigh, mix and bake **savoury muffins**	• I can design a healthy pizza based on available ingredients and can identify the food groups in my recipe. • I know where my ingredients come from locally (food provenance info/allotments) • I know certain local ingredients are available at different times of year due to 'seasonality' • I can follow a recipe to mix, knead and prove pizza dough • I can prepare and cook my **pizza.**	• I can explore how some changes, like some baking and cooking, are irreversible, not because of the heat, but the chemical change, i.e. you cannot uncook an egg but you can dissolve sugar and evaporate the water out to get sugar again, but when it is added to eggs and flour it cannot be extracted. Chocolate can be melted poured into moulds and solidified again • Weigh, sieve, beat, fold, bake and decorate • **Cake**	• I know what is meant by 'food distribution' and the journey from producer to plate. • I know where ingredients are produced locally (food provenance info/allotments/farms/gardens) • I know certain local ingredients are available at different times of year due to 'seasonality' • I can create their own glossary of terminology for food distribution. • I know about food preparation and can cook a variety of savoury dishes from locally produced ingredients. • Make a roux • Make their own **macaroni cheese** • Make a tomato based **pasta sauce**
				• Evaluate what is healthy and what isn't through looking at food labels.		• Food miles • Fair trade (sugar, chocolate)	• Gardening – growing food • Year 6 community garden? • Share produce at

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Design		I know that products are designed with a purpose (what it is) and a function (what it does) and can identify the purpose and function of different products. I can **draw a picture** of the local area and label the movements that moving objects make (fly, roll, drive, walk) I can design an illustrated pop-up book focusing on animals, people and things that move.	I can design a newspaper bridge to carry an egg between two tables over water. This can be tested to destruction with weights. I can **generate designs, draw and talk** about them based on design criteria I can name a range of bridge designs I can create designs for land, water and air based forms of future transport, **label and talk about them.**	I know that different forces can be used to achieve a range of motion in designs I can **design a game** that uses magnetic forces. I can generate, develop, model and communicate ideas for my board game using **talking, drawing and mockups. (non functioning prototype)**	I know how to, develop and design a junk instrument that can change pitch and volume **(respond to a brief)** I can **generate designs, draw and talk about them based on design criteria** of wind, string or percussion	I can design a **purposeful and appealing board game based on design criteria** : trading in my local area I can carry out **market research** around my ideas. (board game design) Linked to… I can **write an advertisement** for my game before making to inform design process. I can design an appealing banner **using Popplet mind map** based on design criteria: representing the twin town / connecting classrooms town and Bristol I can generate, develop and communicate my ideas through **annotated sketches** I can design a product based on a problem: *how to improve the school environment for animals and humans.* **I can develop my own design criteria for the product.** I can generate, develop, model and communicate my ideas through, Discussion, Annotated sketches, **Cross sectional diagrams, Prototypes**	• I can research and develop a design in response to criteria: competition to design a car • Pupils write and deliver a pitch for their car design • I can generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and **exploded diagrams,** prototypes **and computer-aided design**

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Make		• I can select from a range of materials and components and give reasons for my choices. • I can join materials with tape, glue, push pins, staples and paperclips. • I can peel and chop carrots into carrot sticks • I can cut and shape paper with scissors • I can join materials with glue, tape and split pins. • I can use folds, sliders, levers and pivots (wheels)	• I can model my design selecting and using materials, tools and joining methods used so far in this KS1 • I know different materials can be joined in different ways. • I can suggest reasons for the best way to join different materials • I can select from a wide range of different materials (scrapstore) according to their characteristics. • I can join different materials by taping, gluing and tying • I can create designs for land, water and air based forms of future transport, label and talk about them	• I can use scissors, craft knives and cutting boards to cut and shape paper and cardboard accurately. • I know that textiles can be joined by gluing. • I know that patterns are used to cut textiles. • I can combine fabrics based on how they look to create a pennant that represents something. • I can use fabric glue to join textiles • I can make basic patterns	• I can select from a wide range of different materials according to their characteristics. • Practise: I can select appropriate tools and equipment to construct my instrument • I know how to create a functioning paper circuit with light up LEDs • I know that the LEDs must be the correct way around for the circuit to function • I know that the circuit must make a complete loop for the LEDs to light • I can design and make a greetings card that lights up • I can follow a recipe to make pizza dough. • I can prepare and	• ??	• ??

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Evaluate		• I can explore and **talk about** how a range of pop-up books are made and work. (oracy) • I can explore and discuss how a range of flip books are made and work. **(write a sentence)**	I can evaluate my bridge against the design criteria and suggest how it could be improved Did the egg survive? **Annotated photograph in book with suggested improvements,** Record Max weight limit Examples I would roll the paper tighter I would use more tape to strengthen the joins	• I can design, test and evaluate trial designs • **Test and evaluate only magnetic elements** • **documenting what happens in a table changing one variable**	• I can evaluate my instrument **against the design criteria** and improve it by adapting the design **more than one iteration flow diagram** I know that a key part of the design process is to investigate and **analyse existing products.** I know that designs can be improved based on **feedback from others peer review.** I can research, analyse and choose a disposable bathroom product to redesign without plastic **Book creator on the ipads** I can listen to the views of others and make improvements to my design **focus group and critique**	• I can **play test** my boardgame to ensure it is functional. • I can evaluate my design based on the views of others after test plays **create an online survey** • I can **investigate labelled photographs /diagrams** of simple machines that use levers and pulleys. • I can investigate and analayse a range of ingredients based on design criteria: solubility. Notice the clues to chemical changes: bubbles, gases, fizzing, rising - if nothing extra is produced it is usually reversible. • I can investigate and analyse a range of existing products in the same field	• I can create an engineers **project design board** to record observations and use them to **review and revisit ideas (post it notes / annotations / diagrams)**

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Technical Knowledge		• I can explore how structures can be made stronger stiffer and more stable. • I can use folds, sliders, levers and pivots (wheels)	I can explore how and use techniques learnt previously to make structures, stronger stiffer and more stable.	• ??	• ??	• I can make levers and pulleys from a variety of materials and evaluate their effectiveness.	• I can apply skills to strengthen, stiffen & reinforce more complex structure s.

Year 1

- Term 2
- Glove Puppet
- Textiles
- Templates and joining techniques

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Children investigate and evaluate existing products linked to the chosen project. Explore and compare e.g. fabrics, joining techniques, finishing techniques and fastenings used. • Use questions to develop children's understanding e.g. How many parts is it made from? What is it joined with? How is it finished? Why do you think these joining techniques have been chosen? How is it fastened? Who might use it and why? Make drawings of existing products, stating the user and purpose. Identify and label, if appropriate, the fabrics, fastenings and techniques used.	investigate fabrics to determine which is best for the purpose of the product they are creating. • Using prepared teaching aids, demonstrate the use of a template or simple paper pattern. Children could make their own templates or paper patterns. If necessary, they can use ones provided by the teacher. • Using prepared teaching aids, demonstrate the correct use of appropriate tools to mark out, tape or pin the fabric to the templates or paper patterns and cut out the relevant fabric pieces for the product. • Using prepared teaching aids, demonstrate appropriate examples of joining techniques for children to practise in guided groups e.g. running stitch including threading own needle, stapling, lacing and gluing. Talk about the advantages and disadvantages of each technique. • Using prepared teaching aids, demonstrate examples of finishing techniques for children to practise in guided groups e.g. sewing buttons, 3-D fabric paint, gluing sequins, printing	Provide the children with a context that is authentic. Discuss with children the purpose and user of the products they will be designing, making and evaluating. Design criteria developed with the teacher should be used to guide the development and evaluation of the children's products. • Ask the children to generate a range of ideas e.g. What parts will the product need to have and what will it be made from? What size will it be? How will it be joined and finished? • Through talk, drawings and mock-ups, ask the children to develop and communicate their ideas. Information and communication technology could be used for symmetry and pattern ideas. Choose one idea to follow through.	Talk with the children about the stages in making before assembling quality products, applying the knowledge, understanding and skills learnt through the IEAs and FTs. Make	Make	Evaluate ongoing work and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

Resources
existing products linked to chosen project, variety of textiles e.g. dipryl, felt, reclaimed fabric, thread, pins, needles, magnet, staplers, staples, fabric glue, left/right-handed scissors, items for finishing e.g. buttons, wool, fabric paints, sequins, drawing and colouring media
Vocabulary
names of existing products, joining and finishing techniques, tools, fabrics and components, template, pattern pieces, mark out, join, decorate, finish, features, suitable, quality mock-up, design brief, design criteria, make, evaluate, user, purpose, function

Years 1/2

Textiles
Templates and joining

Instant CPD



Tips for teachers

- ✓ It is helpful if each child has a named plastic envelope, zip wallet or folder in which to keep their work safe.
- ✓ Give children the opportunity to join fabrics in a variety of ways through focused tasks and compare the outcomes.
- ✓ In order for children to thread their own needle start by using a needle with a large eye and a sharp point.
- ✓ Children's stitching skills may be in their infancy and fabrics need to be chosen with this in mind. Start with felt as it doesn't fray and progress to other fabrics.
- ✓ Fabrics used for children's products could be reclaimed.
- ✓ Children should be taught to place their templates and pattern pieces economically on the fabric.
- ✓ Children could be reminded of sustainability issues, and of the need to reduce, reuse and recycle.
- ✓ Demonstrate sewing techniques, joining two pieces of fabric e.g. running stitch.
- ✓ Demonstrate other ways of joining, not sewing, to the class e.g. sticking, stapling, lacing.
- ✓ Encourage the children to make a mock-up from dipryl (disposable cloth fabric).
- ✓ Put technical vocabulary onto flash cards.

Useful resources at www.data.org.uk

- Joining and Fastening Fabrics
- Designing with textiles (7-11 years)

EYFS Resources

- Three Bears Picnic Blanket
- Let's Look at Hats

Three alternative ways of using templates and simple pattern pieces

Use clear sticky tape to position pattern on fabric. Cut around the pattern.

Use soft chalk pastel or soft white crayon to draw around the pattern prior to cutting out.

Use pins to secure the pattern on the fabric. Cut around the pattern.

Exploring and evaluating joining techniques

Joining fabric

Gluing

Stapling

Safety pin

Fusing

Sewing

Finishing techniques

Textile paints – glitter

Adding sequins and shiny fabrics

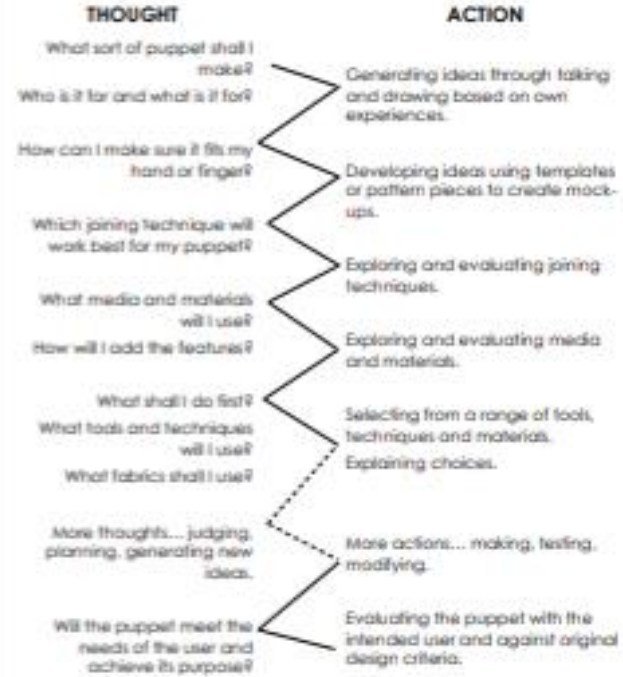
Textile paints – raised

Fabric crayons

Explore different techniques, including information and communication technology, for creating fabric designs and finishing techniques.

Designing, making and evaluating a puppet to perform a play

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:



Glossary

- **Appliqué** – to attach a decorative fabric item onto another piece of fabric by gluing and/or sewing.
- **Design** – to generate, develop and communicate ideas for a product.
- **Embroider** – to decorate fabric with stitches.
- **Evaluate** – to judge how a product meets chosen criteria.
- **Fray** – to unravel or become worn at the edge.
- **Glove puppet** – a glove puppet fits over the hand, and the fingers operate its head and arms.
- **Mock-up** – a model which allows children to try out ideas using cheaper materials and temporary joints.
- **Seam** – a row of stitches joining two pieces of fabric.
- **Sew** – to join pieces of fabric with stitches.
- **Template** – a shape drawn to assist in cutting out shapes.

- Term 5
- Fruit and Vegetable Kebab
- Food
- Preparing Fruit and Vegetables

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Investigate and Evaluate	**Focused Tasks**	**Design**	**Make**	**Evaluate**
Children examine a range of fruit/vegetables. Use questions to develop children's understanding e.g. What is this called? Who has eaten this fruit/vegetable before? Where is it grown? When can it be harvested? What are its taste, smell, texture and appearance? What will it look like if we peel it or cut it in half? What are the different parts called? • Provide opportunities for children to handle, smell and taste fruit and vegetables in order to describe them through talking and drawing. e.g. What words can we use to describe the shape, colour, feel, taste? • Evaluate existing products to determine what the children like best; provide opportunities for the children to investigate preferences of their intended users/suitability for intended purposes e.g. What do you prefer and why? What might we want to include in our product to meet our user's preferences? Which fruit/vegetables might be the best for our product to match the occasion/purpose?	Discuss basic food hygiene practices when handling food including the importance of following instructions to control risk e.g. What should we do before we work with food? Why is following instructions important? • Demonstrate how to use simple utensils and provide opportunities for the children to practise food processing skills such as washing, grating, peeling, slicing, squeezing e.g. Do we eat the whole fruit? Why or why not? Which parts do we eat? What might we have to do before eating this? Why do we cut, grate, peel and slice in this way? Discuss different effects achieved by different processes. • Discuss healthy eating advice, including eating more fruit and vegetables; using The Eatwell Guide model talk about the importance of fruit and vegetables in our balanced diet e.g. Why is it good to eat fruit and vegetables? How many pieces of fruit/vegetables do you eat per day? Why is it important to wash fruit/vegetables before we eat them?	Set a context for designing and making which is authentic and meaningful. • Discuss with the children the possible products that they might want to design, make and evaluate and who the products will be for. Agree on design criteria that can be used to guide the development and evaluation of children's products e.g. Who/what is the product for? What will make our product unique/different? How will we know that we designed and made a successful product? • Use talk and drawings when planning for a product; ask the children to develop, model and communicate their ideas e.g. What will you need? What fruit/vegetable will you need? How much will you need? How will you present the product?	Talk to the children about the main stages in making, considering appropriate utensils and food processes they learnt about through IEAs and FTs. Make	Evaluate as the children work through the project and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

Resources
range of fresh fruit and vegetables, chopping boards, knives, peelers, graters, skewers, juicers, spoons, jugs, plates, bowls, aprons, plastic table covers, hand washing and washing-up facilities, yogurt making machine or blender, if appropriate
Vocabulary
fruit and vegetable names, names of equipment and utensils, sensory vocabulary e.g. soft, juicy, crunchy, sweet, sticky, smooth, sharp, crisp, sour, hard flesh, skin, seed, pip, core, slicing, peeling, cutting, squeezing, healthy diet, choosing, ingredients, planning, investigating tasting, arranging, popular, design, evaluate, criteria

Years 1/2

Food

Preparing fruit and vegetables

Instant CPD

Tips for teachers

- ✓ Display fruit, including photographs and associated technical vocabulary, to encourage the children to use it when discussing, designing and making a food product.
- ✓ Ask the children to sort a selection of fruit and vegetables – which is which? Photo cards could be used for this.
- ✓ Include fruit that is less likely to be known to the children.
- ✓ Stories and poems about food could be used for inspiration and as an introduction to the project.
- ✓ Visit a local shop or food market to give your project a real-life context.
- ✓ Carrots can provide a relatively cheap food for examining the effects of using different equipment such as grating, slicing into thin rings, slicing into sticks.
- ✓ Serrated knives with rounded ends are the best.
- ✓ Foods for chopping/slicing could be cut in half lengthways to provide a flat base and held still with, for example, a fork so that children cut safely.
- ✓ Before you organise any food tasting in your class, you need to check your school and local authority health and safety policy. Seek parental consent.
- ✓ As homework ask children to keep a weekly fruit and vegetable diary and ask them to record their results in a chart/table. If more appropriate, focus on fruit and vegetables served in school.

Useful resources at www.data.org.uk

- **Caribbean fruit cocktails** (7-9 years but contains useful information)
- **Are you teaching food in Primary D&T?**
- **Super salads** (7-9 years but contains useful information)
- **Fantastic fruit**

Other useful web-based resources:

- www.foodafactoflife.org.uk
- http://www.nhs.uk/livewell/5aday/pages/5adayhome.aspx

Teaching aids to demonstrate food processing skills

Peeling

Cutting

Slicing

Grating

Squeezing

Food Processing Equipment

Utensil	Food	Effect	Mouth feel
Juicer 	Orange	Makes juice	Liquid
Peeler 	Apple	Unpeeled apple	Crunchy
Knife 	Carrot	Thin rings	Crispy hard

Hygiene – some key pointers

- Jewellery is removed
- Hair is tied back
- Sleeves are rolled up
- Aprons are on
- Hands are washed
- Cuts are covered with blue waterproof dressing

Further information from www.foodafactoflife.org.uk

Designing, making and evaluating a fruit snack for a class picnic

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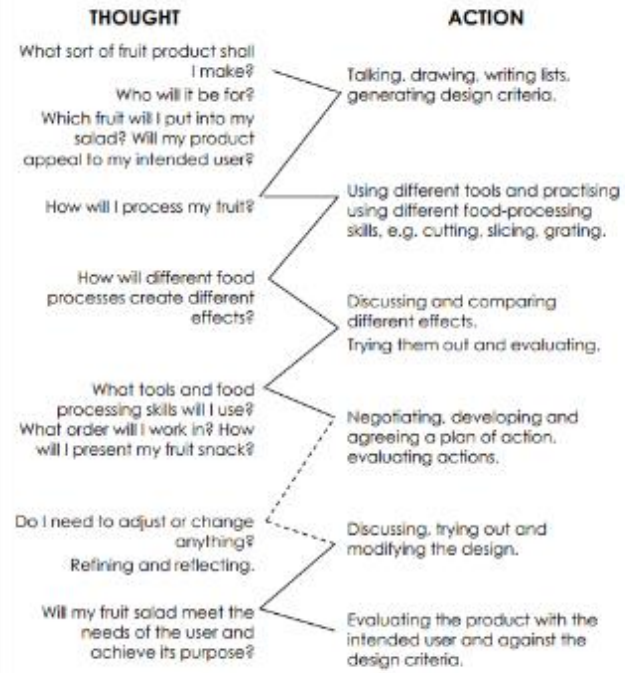


Glossary

- **Fruit** – plant or tree's edible seed with envelope.
- **Vegetable** – plant used for food.
- **Nutrients** – all the things in food that the body needs to remain healthy.
- **Pith** – the soft white lining inside fruit such as oranges.
- **Salad** – a cold dish of fresh and/or cooked vegetables or fruit.
- **Sensory evaluation** – subjective testing of foods where senses are used to evaluate qualities such as appearance, smell, taste, texture (mouth feel).
- **Kebab** – cooked and/or fresh ingredients on a skewer.

- Term 5
- Moving Transport poster
- Mechanisms
- Sliders and Levers

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make		Evaluate
Children explore and evaluate a collection of books and everyday products that have moving parts, including those with levers and sliders. e.g. What is it? Who is it for? What is it for? • Use questions to develop children's understanding e.g. What do you think will move? How will you make it move? What part of the product moved and how did it move? How do you think the mechanism works? What else could move in the product? How well does it work? • Introduce and develop vocabulary e.g. lever, pivot, slider, left, right, push, pull, up, down, forwards, backwards, in, out.	Demonstrate simple levers and sliders to the children using prepared teaching aids. It is helpful if these are also used in context e.g. the slider is used to show a snail appearing from behind a stone, the lever is used to show a butterfly flying to a flower. • Use questions to develop children's understanding e.g. How does the slider move? How does the lever move? Which part of the mechanism is the pivot? What does the movement of the slider and lever remind you of? • Following teacher demonstration of the correct use of tools and materials, children should develop their knowledge and skills by replicating the slider and lever teaching aids. Encourage children to add pictures to their mechanisms. Demonstrate simple levers and sliders to the children using prepared teaching aids. It is helpful if these are also used in context e.g. the slider is used to show a snail appearing from behind a stone, the lever is used to show a butterfly flying to a flower. • Use questions to develop children's understanding e.g. How does the slider move? How does the lever move? Which part of the mechanism is the pivot? What does the movement of the slider and lever remind you of? • Following teacher demonstration of the correct use of tools and materials, children should develop their knowledge and skills by replicating the slider and lever teaching aids. Encourage children to add pictures to their mechanisms.	Discuss with the children what they will be designing, making and evaluating e.g. Who will your product be for? What will be its purpose? How do you want it to move? Will you use a lever or a slider? • Generate simple design criteria with the children e.g. the mechanism should work smoothly, it should make the right type of movement. • Encourage the children to develop their ideas through talking, drawing and making mock-ups of their ideas with paper and card. • Discuss the finishing techniques the children might use e.g. using digital text and graphics, paint, felt tipped pens or collage.	• As a whole class, talk about the order in which the mechanisms will be made. Make	Make	Ask children to evaluate their developing ideas and final products against the original design criteria.

Resources
books and everyday products with levers and slider mechanisms, slider and lever teaching aids, card strips, card rectangles, paper, masking tape, paper fasteners, paper binders, stick glue, PVA glue, finishing materials and media left/right-handed scissors, cutting mats, card drills
Vocabulary
slider, lever, pivot, slot, bridge/guide card, masking tape, paper fastener, join, pull, push, up, down, straight, curve, forwards, backwards, design, make, evaluate, user, purpose, ideas, design criteria, product, function

Years 1/2

Mechanisms
Sliders and levers

Instant CPD

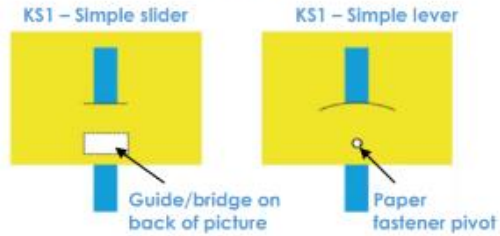
Tips for teachers

- ✓ Using books and prepared examples of simple mechanisms, ask children to explain how the sliders and levers work.
- ✓ Prepare plenty of pre-cut strips of card for making the levers and sliders.
- ✓ To make a small hole for the pivot, a pencil can be used by placing the thin card over a piece of Plasticine or Blu Tack and pressing the pencil through.
- ✓ Guides/bridges can be made using strips of card fixed with masking tape.
- ✓ Display technical vocabulary and encourage the children to use it when discussing mechanisms and when designing and making.
- ✓ Make sure the existing books children investigate include moving pictures that are similar to the teaching aids.
- ✓ Mechanisms are operated directly by the children e.g. the slider is pushed and a snail appears from behind a stone.
- ✓ The mechanisms that children use are found in everyday products in the classroom or the school grounds. For example, levers are used to make door handles and sliders are used to make children's trays.
- ✓ Think about directional language e.g. sliders move in a straight line and levers move in a curve.
- ✓ Children may need extra support when they are attaching paper fasteners to levers.

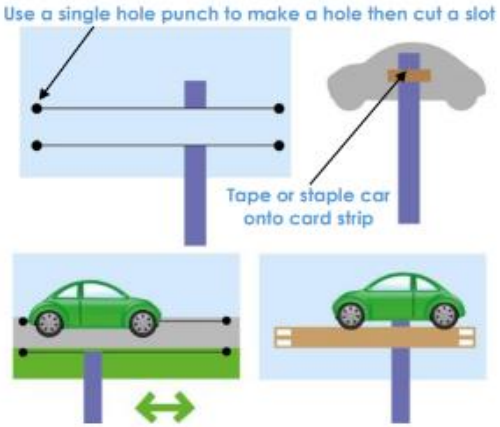
Useful resources at www.data.org.uk

- Moving Pictures
- Moving history book (Yrs 3/4)
- Working with sliders and levers
- Levers and linkages - Poster and Support Pack
- Mechanisms with a message (Yrs 5/6)
- D&T Primary Issue 17 Focus on Mechanisms

Teaching aids to demonstrate sliders and levers

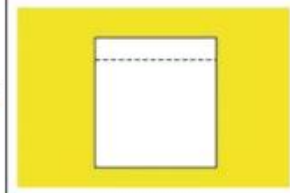


Sliders move from side to side and up and down

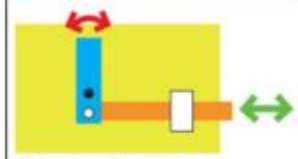


Levers can be used with or without a slot

As an enhancement to this project children could add flaps to their moving pictures. Some children may find flaps, which can be used to make a picture appear and disappear, easier to make than levers or sliders.



Where children have a particularly good understanding of levers and sliders in Key Stage 1, they could be introduced to the simplest lever and linkage mechanism used in Key Stage 2. This will introduce them to the idea of loose and fixed pivots.



Simple mechanisms move...

Designing, making and evaluating a moving storyboard to retell a fairy tale to the class

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

Glossary

- **Mechanism** – a device used to create movement in a product.
- **Lever** – a rigid bar which moves around a pivot. Levers are used in many everyday products. In this project children will use card strips for levers and paper fasteners for pivots.
- **Slider** – a rigid bar which moves backwards and forwards along a straight line. Unlike a lever, a slider does not have a pivot point.
- **Slot** – the hole through which a lever or slider is placed to enable part of a picture to move.
- **Guide or bridge** – a short card strip used to keep sliders in place and control movement.

Year 2

•Term 1
- Structures
- Bridge Building

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Investigate and Evaluate	Focused Tasks	Design	Make	Evaluate

Resources
Vocabulary

- Term 2
- Building Playground equipment
- Structures
- Freestanding Structures

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Go on a walk and/or look at photographs of the local area to explore structures such as playground equipment, street furniture, walls, towers and bridges e.g. What are the structures called and what is their purpose? Who might use them? What materials have been used? Why have these been chosen? How have the parts been joined together? How have the structures been made strong enough? How have they been made stable? • Where possible, ask the children to draw or photograph the structures they have been exploring and label with the correct technical vocabulary in relation to the structure, materials used and shapes e.g. wall, tower, framework, base, joint, metal, wood, plastic, brick, triangle, square, rectangle, cuboid, cube.	Demonstrate measuring, marking out, cutting, shaping, joining and finishing techniques with a range of tools and new and reclaimed materials that children are likely to use to make their structures. Discuss the suitability of materials for their products according to their characteristics. • Ask the children to build and explore a variety of freestanding structures using construction kits, such as wooden blocks, interconnecting plastic bricks and those that make frameworks e.g. How can you stop your structures from falling over? How they can be made stronger and stiffer in order to carry a load? Children could make models of the structures they have seen in school and the local area. • Ask children to fold paper or card in different ways to make freestanding structures, using masking tape where necessary to make joins. Encourage them to think about how folding materials can make them stronger, stiffer, stand up and be more stable e.g. Can they support an object on top of their structures without it falling over or breaking? .	Discuss with the children what structure they will be designing, making and evaluating e.g. Who will your product be for? What will be its purpose? What materials will you use? How will you make it strong and stable? • Generate some simple design criteria with the children e.g. the structure should stand up on its own, it should be strong enough to carry Teddy. • Encourage the children to develop their ideas through talking, drawing and making mock-ups of their ideas with construction kits and other materials.	s a whole class, plan the order in which the structures will be made. Children could make their final products from construction kits, new and reclaimed materials or any combination of these, according to their characteristics. Make	Make	Ask children to evaluate their developing ideas and final products against original design criteria.

Resources

photographs of various structures, construction kits that can be used to construct freestanding structures e.g. walls, towers, frameworks , paper, card, plastic sheet, paper and plastic straws, pipe cleaners, reclaimed materials
including small containers, card boxes, cotton reels, string, masking tape, PVA glue, Plasticine, left/right handed scissors, hole punch, stapler, finishing media and materials

Vocabulary

cut, fold, join, fix, structure, wall, tower, framework, weak, strong, base, top, underneath, side, edge, surface, thinner, thicker, corner, point, straight, curved, metal, wood, plastic circle, triangle, square, rectangle, cuboid, cube, cylinder, design, make, evaluate, user, purpose, ideas, design criteria, product, function

Years 1/2

Structures
Freestanding structures

Instant CPD

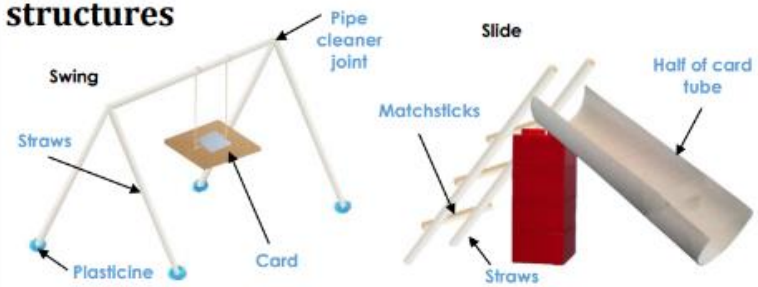
Tips for teachers

- ✓ Create a PowerPoint or range of pictures showing a variety of freestanding structures relevant to the product the children are designing and making.
- ✓ Exploring structures in the local area provides a good opportunity to develop children's observational drawing.
- ✓ Create and display a word bank of relevant technical vocabulary in the classroom.
- ✓ Ensure that work with construction kits and materials builds on children's prior experience in the Early Years Foundation Stage (EYFS).
- ✓ Ensure that different types of construction kits are available for children to explore through focused tasks.
- ✓ It is perfectly acceptable for children's final products to include both construction kits and consumable materials.
- ✓ Demonstrate measuring, marking out, cutting, joining and strengthening techniques and provide help sheets showing instructions for the children to practise independently.
- ✓ Prior to producing their designs, have a range of materials available for children to access and create models.

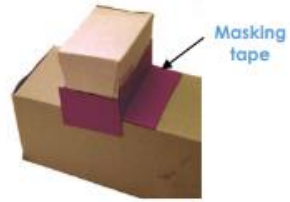
Useful resources at www.data.org.uk

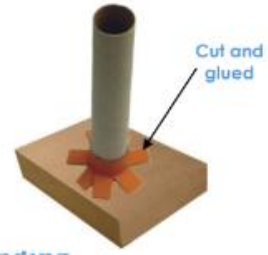
- Door hinges helpsheet
- Let's Get Building and Using Construction Kits Effectively
- Chairs for Three Bears
- Hinges and Catches
- **Bird Hide Design and Make Challenge** (Yrs 5-6)
- **Working with paper straws** (Yrs 3-4)

Techniques for assembling freestanding structures



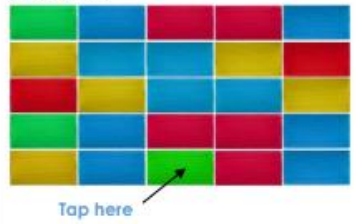
Show children how to join sheet materials and reclaimed boxes together using different tapes and glues.

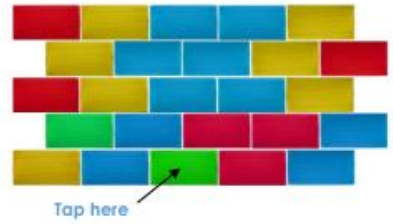


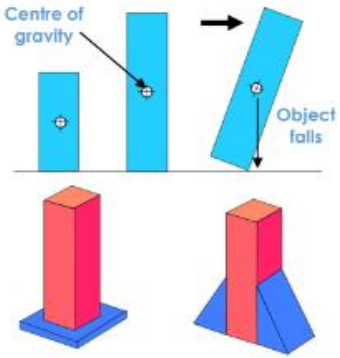


Technical knowledge and understanding

Build walls with these different patterns. Tap away the centre brick in the bottom row of each wall in turn. What happens? Which wall is the strongest?







As a freestanding structure becomes taller its centre of gravity rises. Stability in a structure can generally be increased by making the base wider, making the base heavier or adding buttresses.

Ask the children to build and explore a variety of freestanding structures through focused tasks. Use a range of construction kits.

Designing, making and evaluating a strong chair for Baby Bear

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
What sort of chair shall I make? Who is it for and what is it for?	Choose an appropriate soft toy. Generating ideas through talking and drawing based on own experiences.
How can I make sure it is strong, stiff and stable?	Developing ideas using construction kits to create mock-ups.
Which joining techniques will work best for the chair?	Exploring and evaluating joining techniques.
What media, materials and kits will I use?	Exploring and evaluating construction kits, new and reclaimed materials.
What shall I do first? What tools and techniques will I use? What materials shall I use?	Selecting from a range of tools, techniques and materials. Explaining choices.
More thoughts... judging, planning, generating new ideas.	More actions... making, testing, modifying.
Will the chair meet the needs of the user and achieve its purpose?	Evaluating the chair with a soft toy and against design criteria.

Glossary

- **Freestanding structure** – a structure that stands on its own foundation or base without attachment to anything else.
- **Frame structure** – a structure made from thin components e.g. tent frame.
- **Shell structure** – a hollow structure with a thin outer covering.
- **Stability** – in relation to a freestanding structure, the extent to which it is likely to fall over if a force is applied.
- **Buttress** – a structure added to a wall, tower or framework to make it more stable and/or reinforce it.
- **Brick bonding** – arranging bricks in a wall to improve the performance of the structure or improve its appearance.
- **Mock-up** – 3-D representation of a product.

- Term 2
- Sandwiches & Wraps
- Food
- Healthy and Varied Diet

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Investigate and Evaluate	**Focused Tasks**	**Design**	**Make**	**Evaluate**
Children investigate a range of food products e.g. the content of their lunchboxes over a week, a selection of foods provided for them, food from a visit to a local shop. Link to the principles of a varied and healthy diet using The Eatwell Guide e.g. What ingredients have been used? Which food groups do they belong to? What substances are used in the products e.g. nutrients, water and fibre? • Carry out sensory evaluations on the contents of the food from e.g. a variety of bought food products such as a range of wraps or sandwiches. Record results, for example using a table. Use appropriate words to describe the taste/smell/texture/appearance e.g. How do the sensory characteristics affect your liking for the food? • Gather information about existing products available relating to your product. Visit a local supermarket and/or use the internet. • Find out how a variety of ingredients used in products are grown and harvested, reared, caught and processed e.g. Where and when are the ingredients grown? Where do different meats/fish/cheese/eggs come from? How and why are they processed?	Learn to select and use a range of utensils and use a range of techniques as appropriate to prepare ingredients hygienically including the bridge and claw technique, grating, peeling, chopping, slicing, mixing, spreading, kneading and baking. • Food preparation and cooking techniques could be practised by making a food product using an existing recipe. • Discuss basic food hygiene practices when handling food including the importance of following instructions to control risk e.g. What should we do before we work with food? Why is following instructions important? .	Discuss the purpose of the products that the children will be designing, making and evaluating and who the products will be for. • Develop and agree on design criteria with the children within a context that is authentic and meaningful. This can include criteria relating to healthy eating and a varied diet e.g. What do you need to consider to make it part of a balanced diet? How do we select the ingredients? How could we make it appealing to eat? • Ask children to generate a range of ideas encouraging realistic responses. • Using discussion, annotated sketches and information and communication technology if appropriate, ask the children to develop and communicate their ideas.	Ask children to consider the main stages in making the food product, before preparing/cooking the product including the ingredients and utensils they will need. Make sandwiches	Evaluate as the assignment proceeds and the final product against the intended purpose and user, reflecting on the design criteria previously agreed. Consider what others think of the product when considering how the work might be improved.

Resources
information about foods from around the world, basic recipes, range of relevant example foods to taste and evaluate, suitable equipment and utensils such as: knives, chopping board, weighing scales, measuring jugs, bowls, baking trays, spoons – various sizes, parchment paper, plastic film
Vocabulary
name of products, names of equipment, utensils, techniques and ingredients, texture, taste, sweet, sour, hot, spicy, appearance, smell, preference, greasy, moist, cook, fresh, savoury hygienic, edible, grown, reared, caught, frozen, tinned, processed, seasonal, harvested, healthy/varied diet, planning, design criteria, purpose, user, annotated sketch, sensory evaluations

Years 3/4

Food
Healthy and varied diet

Instant CPD

Tips for teachers

- ✓ When choosing bought products to evaluate, choose some with simple fillings (such as cheese) and others with more variety (such as bacon, lettuce and tomato). Include some with fillings from a variety of cultures.
- ✓ Children may need help to develop design criteria for their product. You can model this by discussing what the design criteria may have been for an existing product that the children have previously evaluated before encouraging them to create their own.
- ✓ If you grow edible plants in the school grounds such as herbs, lettuce or tomatoes, encourage the children to use these in their food product. When possible, use some ingredients which are seasonal and locally sourced.
- ✓ It is advisable to have additional adult support when children are learning to prepare ingredients.
- ✓ Use a range of fresh and processed ingredients.
- ✓ Some ingredients can be cooked using a heat source with adult supervision to introduce children to techniques such as boiling an egg or roasting a pepper.
- ✓ Hygiene: tie long hair back, wear aprons, cover cuts with blue plasters and wash hands thoroughly with soap and dry with a paper towel. More details on www.foodafactoflife.org.uk.
- ✓ Homework idea 1: Ask children to collect pictures of related food products from magazines etc. Research which similar products are used around the world.
- ✓ Homework idea 2: Ask members of the children's family which is their favourite lunch snack and why.

Useful resources at www.data.org.uk

- Dips and Dippers
- Super Salads
- Sandwich Snacks
- Soups - Celebrating culture and seasonality

Other useful web-based resources:

- www.foodafactoflife.org.uk
- http://www.nhs.uk/livewell/5aday/pages/5adayhome.aspx

Wraps

Pitta bread sandwich

Sandwich

Skills and techniques

Grating cheese

Spreading butter on bread

Cutting using the bridge technique

Cutting using the claw technique

Investigating and Evaluating Activities

Children can analyse existing products related to their project using sensory evaluations and record their results in a table. Explain that tasting is not the same as eating. Provide kitchen towel so children can spit out food they do not like. Provide water to cleanse palette between tasting products.

Analysing existing products

Filling	Appearance	Smell	Flavour/ Taste	Texture	Dislike	Neither	Like
1							
2							
3							
4							
Word bank	Colourful Dark/pale Greasy Moist	Fruity Meaty Smoky Oniony Garlicky Fishy	Salty Herby Spicy Fishy Smoky	Crispy Crunchy Soft Chewy Sticky Smooth Hard			

Designing, making and evaluating a bread-based product with a filling for lunch, such as a wrap, a sandwich, a roll, a blini or a toastie

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
Who am I making the food product for? How can I make it appealing for the range of users?	Discussing and communicating ideas, researching existing products, drawing annotated sketches, generating design criteria.
What kind of food product shall I make that can be carried easily? What ingredients could it contain?	Referring back to sensory evaluations carried out in IEAs.
How will I make sure it looks appealing as well as tastes and smells good?	Discussing ideas and how the type of food product and way it is eaten will affect the design.
What techniques will I use to prepare the ingredients and what equipment do I need?	Peeling, chopping, slicing, grating, spreading. Using tools such as round ended knives, vegetable peelers, apple corers, strawberry hullers and graters. Listing the equipment required.
How long will it take? What order will I work in?	Planning the order of the activity and timescale.
More thoughts... appraising, reflecting and refining.	Acting on ongoing evaluation to make appropriate changes.
Has the snack met the needs of the user and achieved its purpose?	Evaluating the food product against the design criteria including the user and purpose. Recording final product through an annotated sketch.

Glossary

- **Appearance** – how the food looks to the eye.
- **Texture** – how the product feels in the mouth.
- **Sensory evaluation** – evaluating food products in terms of the taste, smell, texture and appearance.
- **Preference test** – trying different foods and deciding which you like best.
- **Strawberry huller** – tool to remove the stalk and leaves from a strawberry.
- **Processed food** – ingredients that have been changed in some way to enable them to be eaten or used in food preparation and cooking.

- Term 6
- Land Vehicle
- Mechanisms
- Wheels and Axles

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Explore and evaluate a range of wheeled products such as toys and everyday objects. Through questioning, direct children's observations e.g. the number, size, position and methods of fixing wheels and axles. How do you think the wheels move? How do you think the wheels are fixed on? Why do you think the product has this number of wheels? Why do you think the wheels are round? • Draw an example of a wheeled product, stating the user and purpose, and labelling the main parts e.g. body, chassis, wheels, axles and axle holders. • Walk around the school building and grounds, recording how wheels and axles are used in daily life. • Read a story or non-fiction book that includes a wheeled product. Use this to introduce relevant vocabulary and to emphasise user and purpose.	Using construction kits with wheels and axles, ask children to make a product that moves. • Demonstrate to children how wheels and axles may be assembled as either fixed axles or free axles. • Show different ways of making axle holders and stress the importance of making sure the axles run freely within the holders. • Ensure that children are taught how to mark out, hold, cut and join materials and components correctly. • Using samples of materials and components they will use when designing and making, ask the children to assemble some examples of wheel, axle, axle holder combinations. Display the work completed as a reference for their DMEA.	Discuss with the children what they will be designing, making and evaluating within an authentic context. • With the children identify a user and purpose for the product and generate simple criteria. • Ask children to generate, develop and communicate their ideas as appropriate e.g. through talk and drawing. Talk about, evaluate and share ideas with other children/adults.	Make their wheel and axle product using their design ideas and criteria as an ongoing guide.	Discuss how the children might add finishing techniques to their product with reference to their design ideas and criteria. Direct the children to information and communication technology opportunities such as clip art, word processing, paint or simple drawing programs. Make	Ask children to evaluate their finished product, communicating how it works and how it matches their design criteria, including any changes they made.

Resources
selection of toy vehicles with differently fixed axles, card boxes, card, cotton reels, plastic tubing, dowel, clothes pegs, paper sticks/dowel, paper/plastic straws, card discs, MDF wheels, wooden wheels, single hole punch, card drill, cutting mat, masking tape, PVA glue, paint, thin/thick paint brushes, felt tip pens, decorative paper, double sided sticky fixers, junior hacksaw, vice, left/right-handed scissors
Vocabulary
vehicle, wheel, axle, axle holder, chassis, body, cab assembling, cutting, joining, shaping, finishing, fixed, free, moving, mechanism, names of tools, equipment and materials used, design, make, evaluate, purpose, user, criteria, functional

Years 1/2

Mechanisms
Wheels and axles

Instant CPD

Tips for teachers

- ✓ Ensure a variety of different shaped boxes are available so children can select the one most appropriate for their design.
- ✓ Provide wheels with a range of diameters and thicknesses for children to explore and select the most suitable.
- ✓ A card disc glued onto a wooden/MDF wheel is easy to draw on to add details using felt tip pens.
- ✓ To add a trailer, use flat magnets glued onto the ends of boxes (opposite poles outwards) or short pieces of pipe cleaner bent to form a 'hook and eye'.
- ✓ **Homework** – ask children to complete a checklist of different types of vehicles and how many of each one they see in their local area.
- ✓ **Homework** – ask the children to record a range of wheeled toys. They could record in writing or with pictures such as drawings, cut outs or photographs.

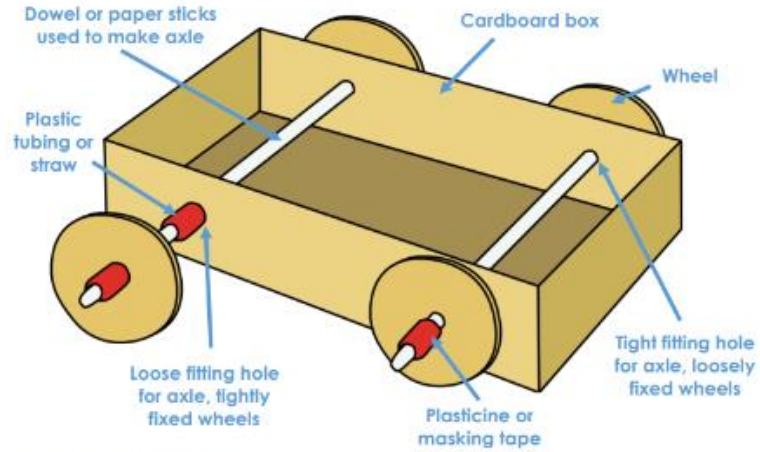
Useful resources at www.data.org.uk

- **Working with wheels and axles** (9-11 years but contains useful information)

EYFS Resources

- **Let's Look at Vehicles** PowerPoints with a range of wheels with discussion prompts and 'design a vehicle for an alien' activity and lesson planning.
- **Toys** Activities and goals for teaching about toys, including building a toy collection and practical skills.
- **D&T Primary issue 34** Innovations in wheel design. Years 4-6.

Two different ways to fix wheels



Types of wheels

Ways to hold moving axles

Use **pairs of clothes pegs** glued with PVA to the underside of a box.
Check the peg holes are large enough to allow axles to move freely.
Make sure they are aligned carefully so the vehicle moves in a straight line when the wheel and axle mechanism is added.

Use **card triangles** with holes for the axle.
Check the holes are large enough to allow the axle to move freely.
Make sure opposite triangles are aligned carefully so the vehicle moves in a straight line when the wheel and axle mechanism is added.

Use **large paper/plastic straws** fixed with masking tape to the underside of a box.
Check straws are positioned carefully so the vehicle will move in a straight line when the wheel and axle mechanisms are added.
Make sure the straw hole is large enough to allow the axle to move freely. The wheels must be fixed tightly to the axle.

Designing, making and evaluating a small wheeled trolley that will carry tools to use in the school garden or for a character in a story

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
Who am I making the trolley for?	Talk about and explore a range of existing wheeled products.
How many wheels will it need? What type of wheels will be best?	Discuss and consider the best size and material from the wheels available.
What does it need to carry?	Talk about the surfaces the trolley might have to travel over.
	Discuss and list the things that need to be carried.
Should there be sections for different items? How big does each section need to be?	Use drawings and collect different sized and shaped boxes. Clarify and model ideas using the boxes.
Do we want to pull or push it? Which way moves best?	Try out existing trolleys and test out ideas including different types of handles.
How could it be appealing as well as functional?	
What tools, resources and materials will we need?	Talk about and combine ideas to create designs.
What will I do if something does not work as planned?	Think about and collect resources Select appropriate tools.
How will I check the trolley is fit for the user and for its purpose as I make it?	Reflect on and refine ideas and designs as the process develops.
What do I think about my final product.	Frequently test the movement and design of the trolley with and without contents.
	Reflect and evaluate against the original design criteria.

Glossary

- **Axle** – a rod on which one or more wheels can rotate, either freely or be fixed to and turn with the axle.
- **Axle holder** – the component through which an axle fits and rotates.
- **Chassis** – the frame or base on which a vehicle is built.
- **Friction** – resistance which is encountered when two things rub together.
- **Dowel** – wooden rods used for making axles to hold wheels.

Year 3

•Term3

- Moving Scene
- Mechanical Systems
- Levers and Linkages
- Pushes and Pulls

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Children investigate, analyse and evaluate books and, where available, other products which have a range of lever and linkage mechanisms. • Use questions to develop children's understanding e.g. Who might it be for? What is its purpose? What do you think will move? How will you make it move? What part moved and how did it move? How do you think the mechanism works? What materials have been used? How effective do you think it is and why? What else could move?	Demonstrate a range of lever and linkage mechanisms to the children using prepared teaching aids. • Use questions to develop children's understanding e.g. Which card strip is the lever? Which card strip is acting as the linkage? Which part of the system is the input and which part the output? What does the type of movement remind you of? Which are the fixed pivots and which are the loose pivots? • Demonstrate the correct and accurate use of measuring, marking out, cutting, joining and finishing skills and techniques. • Children should develop their knowledge and skills by replicating one or more of the teaching aids	Develop a design brief with the children within a context which is authentic and meaningful. • Discuss with children the purpose of the products they will be designing and making and who the products will be for. Ask the children to generate a range of ideas, encouraging creative responses. Agree on design criteria that can be used to guide the development and evaluation of the children's products. • Using annotated sketches and prototypes, ask the children to develop, model and communicate their ideas	Ask the children to consider the main stages in making before assembling high quality products, drawing on the knowledge, understanding and skills learnt through IEAs and FTs. Make	Make	Evaluate the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

Resources
books and other products with lever and linkage mechanisms, lever and linkage teaching aids, card strips, card rectangles, paper, masking tape, paper fasteners, paper binders, stick glue, left/right-handed scissors, cutting mats, card drill, finishing media and materials
Vocabulary
mechanism, lever, linkage, pivot, slot, bridge, guide system, input, process, output linear, rotary, oscillating, reciprocating user, purpose, function prototype, design criteria, innovative, appealing, design brief

Years 3/4

Mechanisms
Levers and linkages

Instant CPD

Tips for teachers

- ✓ Give children the opportunity to make examples of lever and linkage mechanisms though focused tasks.
- ✓ Preparing a plentiful supply of card strips can be useful to speed up the process.
- ✓ Card from recycled packaging is a cost-efficient way of providing enough material for children to experiment with different arrangements and to make mock-ups and prototypes.
- ✓ When working with thin card, a hole can be made for the paper fastener pivot by pressing a pencil through the card on to a piece of Plasticine or Blu Tack.
- ✓ A picture can be drawn on and cut out from another piece of card and glued on to the output levers.
- ✓ Windows can be cut out of the backing sheet or extra pieces added so that the picture on the output lever is hidden and then revealed.
- ✓ The backing sheet can be shaped to suit the picture.
- ✓ Guides/bridges can be made using strips of card fixed with masking tape e.g. white card on diagrams.
- ✓ Display technical vocabulary and encourage the children to use it when discussing mechanisms and when designing and making.
- ✓ Make sure the existing books children investigate include moving pictures that are similar to the teaching aids.

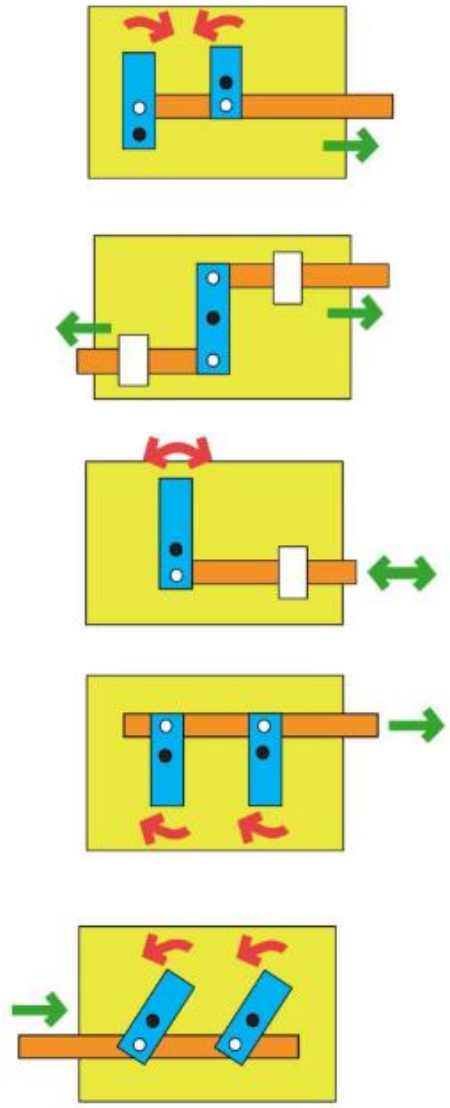
Useful resources at www.data.org.uk

- Levers and linkages - Poster and Support Pack
- Mechanisms with a message
- Moving history book
- Working with Sliders and Levers (Years 1/2)

Teaching aids to demonstrate levers and linkages

Fixed pivot

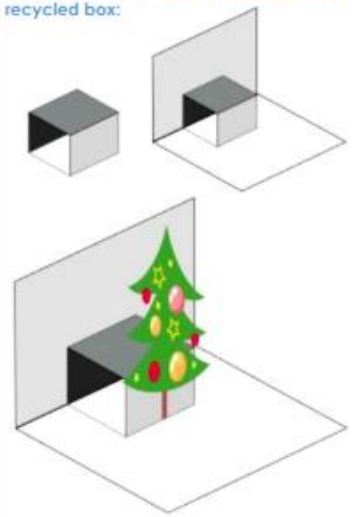
Loose pivot



When you push the card strip (input movement), the two levers move (output movement).

Pop-up mechanisms can be added to children's moving pictures as an enhancement. However, to build on work with simple levers and sliders in KS1, it is important to focus children's learning during this project on levers and

Making a pop-up from a small section of a recycled box:



1. Cut a slice off a small box.
2. Glue two sides to the paper.
3. Stick a picture to pop up on the front.

Lever and linkage mechanisms usually produce oscillating or reciprocating movement:

- Linear – in a straight line
- Reciprocating – backwards and forwards in a straight line e.g. a slider
- Rotary – round and round e.g. a wheel, cam, pulley, gear wheel
- Oscillating – backwards and forwards in an arc e.g. a lever

Designing, making and evaluating a greetings card with moving parts for family or friends

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
What sort of greetings card shall I make and who will it be for? What part will move? How will it appeal to the user?	Discussing ideas, drawing annotated sketches, generating design crite
How will it move?	Discussing ideas, mode possible lever and linka mechanisms.
Which lever and linkage mechanism will work best for my greetings card?	Discussing and evaluati mock-ups and prototyp against design criteria.
What media and materials will I use?	Discussing, exploring and trialling media and materials.
Who will I work with? How long will it take? What order will I work in? What tools and techniques will I use?	Negotiating, developing and agreeing a plan of action.
More thoughts ... appraising, reflecting, refining.	More actions ... building, testing, modifying.
Will the greetings card meet the needs of the user and achieve its purpose?	Evaluating the greetings card with the intended user and against design criteria.

Glossary

- **Mechanism** – a device used to create movement in a product.
- **Lever** – a rigid bar which moves around a pivot. Levers are used in many everyday products. In this project children will use card strips for levers and paper fasteners for pivots.
- **Linkage** – the card strips joining one or more levers to produce the type of movement required. The term 'linkage' is also used to describe the lever and linkage mechanism as a whole.
- **Slot** – the hole through which a lever is placed to enable part of a picture to move.
- **Guide or bridge** – a short card strip used to keep lever and linkage mechanisms in place and control movement.
- **Loose pivot** – a paper fastener that joins card strips together.
- **Fixed pivot** – a paper fastener that joins card strips to the backing card.
- **System** – a set of related parts or components used to create an outcome. Systems have an input, process and an output. In a lever and linkage mechanism, the 'input movement' is where the user pushes or pulls a card strip. The 'output movement' is where one or more parts of the picture move.

•Term 4
- Pennant
- Textiles
- 2D Shape to 3D product

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
• Children investigate a range of textile products that have a selection of stitches, joins, fabrics, finishing techniques, fastenings and purposes, linked to the product they will design, make and evaluate. Think about products from the past and what changes have been made in textile production and products e.g. the invention of zips and Velcro. • Give children the opportunity to disassemble appropriate textiles products to gain an understanding of 3-D shape, patterns and seam allowances. • Use questioning to develop understanding e.g. What is its purpose? Which one is most suited to its purpose? What properties/characteristics does the fabric have? Why has this fabric been chosen? How has the fabric been joined together? How effective are its fastenings? How has it been decorated? Does its decoration have a purpose? What would the 2-D pattern piece look like? What are its measurements? How might you change the product?	• Demonstrate a range of stitching techniques and allow children to practise sewing two small pieces of fabric together, demonstrating the use of, and need for, seam allowances. • Allow children to use a textile product they have taken apart to create a paper pattern using 2-D shapes. • Provide a range of fabrics – children to consider whether fabrics are suitable for the chosen purpose and user. The fabrics also can be used for demonstrating and testing out a range of decorative finishing techniques e.g. appliqué, embroidery, fabric pens/paints, printing. • Use questioning to develop understanding e.g. Which joining technique makes the strongest seam? Why? Which stitch is appropriate for the purpose? Which joining techniques are suitable for the fabric and purpose? How can you stiffen your fabric? What is the purpose of the fastenings? Which one is most suited to the purpose and user? What decorative techniques have been used? What effect do they have?	Children to create a design brief, supported by the teacher, set within a context which is authentic and meaningful. Discuss the intended user, purpose and appeal of their product. Create a set of design criteria. • Ask children to sketch and annotate a range of possible ideas, constantly encouraging creative thinking. Produce mock-ups and prototypes of their chosen product. • Plan the main stages of making e.g. using a flowchartor storyboard.	Children to assemble their product using their existing knowledge, skills and understanding from IEAs and FTs. Encourage children to think about the aesthetics and quality finish of their product. Make	Make	Evaluate as the process is undertaken and the final product in relation to the design brief and criteria. The product should be tested by the intended user and for its purpose and others' views sought to help with identifying possible improvements.

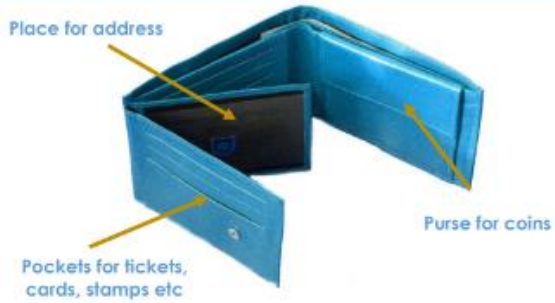
Resources
collection of textile products linked to the chosen product to be made, selection of fabrics and fastenings, left/right-handed scissors, needles, thread, tape, fabric glue, pins, measuring tape, items to use for finishing e.g. fabric paints, threads, appliqué pieces, paints for printing, thin paint brushes
Vocabulary
fabric, names of fabrics, fastening, compartment, zip, button, structure, finishing technique, strength, weakness, stiffening, templates, stitch, seam, seam allowance, user, purpose, design, model, evaluate, prototype, annotated sketch, functional, innovative, investigate, label, drawing, aesthetics, function, pattern pieces

Years 3/4

Textiles

2-D shape to 3-D product

Instant CPD



Tips for teachers

- ✓ Have simple patterns available for children who may find it difficult to create their own.
- ✓ Demonstrate stitching techniques and have help sheets showing stitch instructions for the children to practise independently.
- ✓ Complete sewing practice in small groups. Use adult helpers to provide additional support. Possibly set up a rotation of activities.
- ✓ Demonstrate finishing techniques; let the children practise on small pieces of fabric.
- ✓ Have a limited range of fasteners.
- ✓ Use recycled fabrics e.g. old clothing, ensuring they are easy to work with.
- ✓ Use dipryl or J-cloth type fabric for prototypes.
- ✓ Have a range of products and pictures for children to investigate. Try to use at least one product that can be disassembled so children can see all the parts.
- ✓ Games could be made with technical vocabulary cards e.g. pairs.

Useful resources at www.data.org.uk

- Aprons
- Fancy a bag?
- Designing with textiles
- Bendy bags (Years 1/2)
- A to Z of D&T
- Working with Materials

Teaching aids – joining techniques


Back stitch


Backwards running stitch


Over sew stitch


Blanket stitch


Running stitch

Cutting out techniques


Ensure template is secured to fabric to allow for accuracy. Double sided tape can be used instead of pins to do this.


Place pattern pieces carefully to avoid wastage.

To move children's learning on, as enhancement activities, children could research into different types of fabrics and how they are constructed. They could carry out tests to check e.g. strength, waterproofness or flexibility to ensure their chosen fabric can be used to create a product that meets the needs of user and is fit for purpose.


Bonded

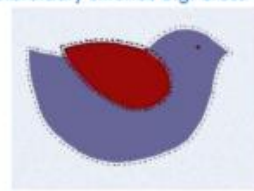

Woven


Knitted


Felted

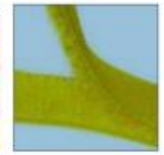
Decorative Techniques


Embroidery stitches e.g. cross-stitch


Appliqué by gluing or stitching

Possible fastenings


Buttons


Velcro

Designing, making and evaluating a holder/purse/wallet for a friend or relative

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
Who is it for? What will it hold? e.g. phone, money, plastic cards, pencils.	Discuss ideas; create a list of likes and dislikes of the user Generate design criteria
What shape will the holder be? How will it fasten?	Investigate a range of templates/patterns and choose the most appropriate one for purpose Create initial design ideas
What fabric should I use?	Discuss and explore different fabrics suitable for purpose Possibly test fabrics for strength/waterproofness
Which joining techniques would be the best for the fabric and pattern?	Discuss and test out different joining techniques on mock ups Evaluate these against the design criteria
How can I make my holder aesthetically pleasing for the user?	Test out a range of decorative techniques and decide on the one/s which are appropriate
How long will it take to make? What tools will I need? What order should I do it in?	Create the holder following the design
Reflection and refining What isn't working very well? What could I improve on?	Make suitable adjustment during the making process Develop the plan during the making
Will my holder/purse/wallet fulfill its function? Is it suitable for the user?	Test out the product Make an evaluation with the user against the initial design criteria and design ideas

Glossary

- **Appliqué** – means 'applied' - describes method of stitching/gluing patches onto fabric (originally to mend holes in worn clothes) to provide decoration.
- **Pattern/Template** – a shape drawn to exact shape and size and used to assist cutting out.
- **Seam** – a line of stitching that joins pieces of fabrics together.
- **Seam Allowance** – extra fabric allowed for joining together - usually 1.5cm.
- **Prototype** – a model that is made to test whether a design will work.
- **Aesthetics** – the way in which the product looks with the nature and expression of beauty.

•Term6
- Savoury Muffin
- Food
- Healthy and Varied Diet

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Investigate and Evaluate	**Focused Tasks**	**Design**	**Make**	**Evaluate**
• Children investigate a range of food products e.g. the content of their lunchboxes over a week, a selection of foods provided for them, food from a visit to a local shop. Link to the principles of a varied and healthy diet using The Eatwell Guide e.g. What ingredients have been used? Which food groups do they belong to? What substances are used in the products e.g. nutrients, water and fibre? • Carry out sensory evaluations on the contents of the food from e.g. a variety of bought food products such as a range of wraps or sandwiches. Record results, for example using a table. Use appropriate words to describe the taste/smell/texture/appearance e.g. How do the sensory characteristics affect your liking for the food? • Gather information about existing products available relating to your product. Visit a local supermarket and/or use the internet. • Find out how a variety of ingredients used in products are grown and harvested, reared, caught and processed e.g. Where and when are the ingredients grown? Where do different meats/fish/cheese/eggs come from? How and why are they processed?	Learn to select and use a range of utensils and use a range of techniques as appropriate to prepare ingredients hygienically including the bridge and claw technique, grating, peeling, chopping, slicing, mixing, spreading, kneading and baking. • Food preparation and cooking techniques could be practised by making a food product using an existing recipe. • Discuss basic food hygiene practices when handling food including the importance of following instructions to control risk e.g. What should we do before we work with food? Why is following instructions important? .	Discuss the purpose of the products that the children will be designing, making and evaluating and who the products will be for. • Develop and agree on design criteria with the children within a context that is authentic and meaningful. This can include criteria relating to healthy eating and a varied diet e.g. What do you need to consider to make it part of a balanced diet? How do we select the ingredients? How could we make it appealing to eat? • Ask children to generate a range of ideas encouraging realistic responses. • Using discussion, annotated sketches and information and communication technology if appropriate, ask the children to develop and communicate their ideas.	Ask children to consider the main stages in making the food product, before preparing/cooking the product including the ingredients and utensils they will need. Make muffins	Evaluate as the assignment proceeds and the final product against the intended purpose and user, reflecting on the design criteria previously agreed. Consider what others think of the product when considering how the work might be improved.

Resources
information about foods from around the world, basic recipes range of relevant example foods to taste and evaluate, suitable equipment and utensils such as: knives, chopping board, weighing scales, measuring jugs, bowls, baking trays, spoons – various sizes, parchment paper, plastic film
Vocabulary
name of products, names of equipment, utensils, techniques and ingredients, texture, taste, sweet, sour, hot, spicy, appearance, smell, preference, greasy, moist, cook, fresh, savoury, hygienic, edible, grown, reared, caught, frozen, tinned, processed, seasonal, harvested, healthy/varied diet, planning, design criteria, purpose, user, annotated sketch, sensory, evaluations

Years 3/4

Food
Healthy and varied diet

Instant CPD

Tips for teachers

- ✓ When choosing bought products to evaluate, choose some with simple fillings (such as cheese) and others with more variety (such as bacon, lettuce and tomato). Include some with fillings from a variety of cultures.
- ✓ Children may need help to develop design criteria for their product. You can model this by discussing what the design criteria may have been for an existing product that the children have previously evaluated before encouraging them to create their own.
- ✓ If you grow edible plants in the school grounds such as herbs, lettuce or tomatoes, encourage the children to use these in their food product. When possible, use some ingredients which are seasonal and locally sourced.
- ✓ It is advisable to have additional adult support when children are learning to prepare ingredients.
- ✓ Use a range of fresh and processed ingredients.
- ✓ Some ingredients can be cooked using a heat source with adult supervision to introduce children to techniques such as boiling an egg or roasting a pepper.
- ✓ Hygiene: tie long hair back, wear aprons, cover cuts with blue plasters and wash hands thoroughly with soap and dry with a paper towel. More details on www.foodafactoflife.org.uk.
- ✓ Homework idea 1: Ask children to collect pictures of related food products from magazines etc. Research which similar products are used around the world.
- ✓ Homework idea 2: Ask members of the children's family which is their favourite lunch snack and why.

Useful resources at www.data.org.uk

- Dips and Dippers
- Super Salads
- Sandwich Snacks
- Soups - Celebrating culture and seasonality

Other useful web-based resources:

- www.foodafactoflife.org.uk
- http://www.nhs.uk/livewell/5aday/pages/5adayhome.aspx

Wraps

Pitta bread sandwich

Sandwich

Skills and techniques

Grating cheese

Spreading butter on bread

Cutting using the bridge technique

Cutting using the claw technique

Investigating and Evaluating Activities

Children can analyse existing products related to their project using sensory evaluations and record their results in a table. Explain that tasting is not the same as eating. Provide kitchen towel so children can spit out food they do not like. Provide water to cleanse palette between tasting products.

Analysing existing products

Filling	Appearance	Smell	Flavour/ Taste	Texture	Dislike	Neither	Like
1							
2							
3							
4							
Word bank	Colourful Dark/pale Greasy Moist	Fruity Meaty Smoky Oniony Garlicky Fishy	Salty Herby Spicy Fishy Smoky	Crispy Crunchy Soft Chewy Sticky Smooth Hard			

Designing, making and evaluating a bread-based product with a filling for lunch, such as a wrap, a sandwich, a roll, a blini or a toastie

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
Who am I making the food product for? How can I make it appealing for the range of users?	Discussing and communicating ideas, researching existing products, drawing annotated sketches, generating design criteria.
What kind of food product shall I make that can be carried easily? What ingredients could it contain?	Referring back to sensory evaluations carried out in IEAs.
How will I make sure it looks appealing as well as tastes and smells good?	Discussing ideas and how the type of food product and way it is eaten will affect the design.
What techniques will I use to prepare the ingredients and what equipment do I need?	Peeling, chopping, slicing, grating, spreading. Using tools such as round ended knives, vegetable peelers, apple corers, strawberry hullers and graters. Listing the equipment required.
How long will it take? What order will I work in?	Planning the order of the activity and timescale.
More thoughts... appraising, reflecting and refining.	Acting on ongoing evaluation to make appropriate changes.
Has the snack met the needs of the user and achieved its purpose?	Evaluating the food product against the design criteria including the user and purpose. Recording final product through an annotated sketch.

Glossary

- **Appearance** – how the food looks to the eye.
- **Texture** – how the product feels in the mouth.
- **Sensory evaluation** – evaluating food products in terms of the taste, smell, texture and appearance.
- **Preference test** – trying different foods and deciding which you like best.
- **Strawberry huller** – tool to remove the stalk and leaves from a strawberry.
- **Processed food** – ingredients that have been changed in some way to enable them to be eaten or used in food preparation and cooking.

Year 4

•Term 3
- Electrical Systems
- Simple Switches and Circuits
- Paper Circuit Greeting Card

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Discuss, investigate and, where practical, disassemble different examples of relevant battery-powered products, including those which are commercially available e.g. Where and why they are used? How does the product work? What are its key features and components? How does the switch work? Is the product manually controlled or controlled by a computer? What materials have been used and why? How is it suited to its intended user and purpose? • Ask children to investigate examples of switches, including those which are commercially available, which work in different ways e.g. push-to-make, push-to-break, toggle switch. Let the children use them in simple circuits e.g. How might different types of switches be useful in different types of products? • Remind children about the dangers of mains electricity.	Recap with the children how to make manually controlled, simple series circuits with batteries and different types of switches, bulbs and buzzers. Discuss which of the components in the circuit are input devices e.g. switches, and which are output devices e.g. bulbs and buzzers. • Demonstrate how to find a fault in a simple circuit and correct it, giving pupils opportunities to practise. • Use a simple computer control program with an interface box or standalone control box to physically control output devices e.g. bulbs and buzzers. • Ask the children to make a variety of switches by using simple classroom materials e.g. card, corrugated plastic, aluminium foil, paper fasteners and paper clips. Encourage children to make switches that operate in different ways e.g. when you press them, when you turn them, when you push them from side to side. Ask the children to test their switches in a simple series circuit. • Teach children how to avoid making short circuits.	Develop a design brief with the children within a context which is authentic and meaningful. • Discuss with children the purpose of the battery-powered products that they will be designing and making and who they will be for. Ask the children to generate a range of ideas, encouraging realistic responses. Agree on design criteria that can be used to guide the development and evaluation of the children's products, including safety features. • Using annotated sketches, cross-sectional and exploded diagrams, as appropriate, ask the children to develop, model and communicate their ideas.	Ask the children to consider the main stages in making and testing before assembling high quality products, drawing on the knowledge, understanding and skills learnt through IEAs and FTs. Make	Make	• Evaluate throughout and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed

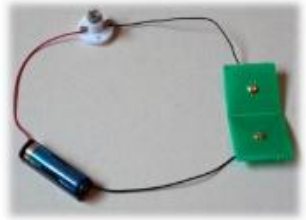
Resources
handling collection of battery-powered electrical products switches including toggle, push-to-make and push to-break, aluminium foil, paper fasteners, paper clips, card, corrugated plastic, reclaimed materials, finishing materials and media, buzzers, bulbs, bulb holders, zinc carbon or zinc chloride batteries, batteries, battery holders, wire, automatic wire strippers, suitable control program with interface box or standalone control box, right/left-handed scissors, PVA glue, cutting mats
Vocabulary
series circuit, fault, connection, toggle switch, push-to-make switch, push-to-break switch, battery, battery holder, bulb, bulb holder, wire, insulator, conductor, crocodile clip control, program, system, input device, output device, user, purpose, function, prototype, design criteria, innovative, appealing, design brief

Years 3/4

Electrical Systems

Simple circuits and switches

Instant CPD



Tips for teachers

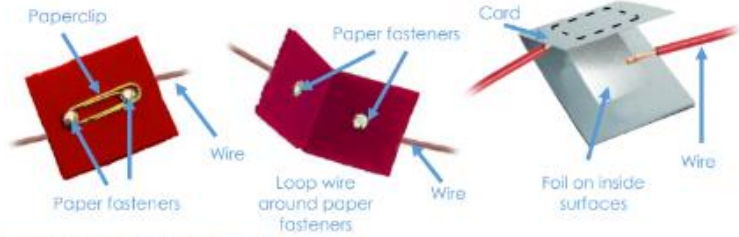
- ✓ This project should be undertaken either around the same time or soon after electricity is covered in science.
- ✓ Use a selection of images of existing battery-powered products to add to the actual products that children investigate and evaluate.
- ✓ Check the condition of the batteries prior to activities.
- ✓ Stress the need for making secure connections.
- ✓ To reduce the number of requests for help, model the fault-finding process: check all the connections, ensure that bulbs are screwed in tightly and ensure that components are correctly connected.
- ✓ Have a 'working' circuit set up so that children can test suspect components.
- ✓ Some components (e.g. buzzers) need to be connected the right way round in a circuit, ensuring positive and negative match the poles of the battery.
- ✓ Make sure bulbs and batteries match e.g. 1.5v bulb with a 1.5v battery.
- ✓ Do not use rechargeable batteries.
- ✓ CLEAPS recommend zinc carbon and zinc chloride batteries for Primary schools, not rechargeable, lithium of alkaline as these can overheat if short circuited. Button batteries are not recommended for younger children.

Useful resources at www.data.org.uk

- Torches, Lamps and Lanterns
- Developing Handmade Switches
- Night lights (links to Literacy)
- Handmade Switches Helpsheet
- Alarming Vehicles

Making secure connections

Handmade switches



Commercial switches

Push-to-break switch
The switch is off while the button is pushed, but returns to its 'on' position when button is released.

Push-to-make switch
When you push, the electricity flows through the circuit, but when you release it the circuit is broken and the switch is off.

Reed switch
Activated by a magnet – this closes the contacts and completes the circuit.

Toggle switch
Simple on/off switch

Standalone control box

When children are familiar with using electrical circuits they should be introduced to a simple standalone control box or an interface box. The box will replace their switches and battery, and children can program their product to work automatically.

Designing, making and evaluating a night light for a brother, sister or friend

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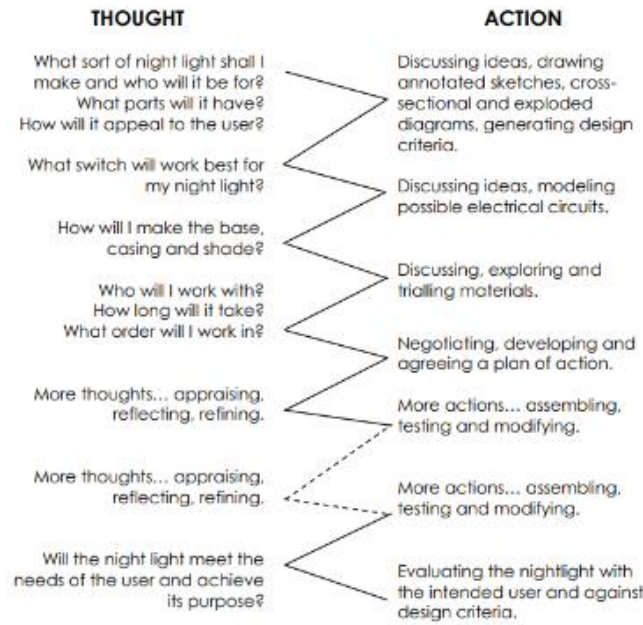

Glossary

- **Circuit** – path through which electricity passes.
- **Conductor** – a material which allows an electric current to pass through it.
- **Insulator** – a material which does not easily allow electric current to pass through it.
- **Prototype** – a model made to test whether a design will work.
- **Push-to-break switch** – a switch turned off by pressing it.
- **Push-to-make switch** – a switch turned on by pressing it.
- **Reed switch** – a switch operated by a magnet.
- **Toggle switch** – a switch operated when a lever is pressed.
- **System** – a set of related parts or components that together achieve a desired outcome.
- **Output devices** – components that produce an outcome e.g. bulbs and buzzers.
- **Input devices** – components that are used to control an electrical circuit e.g. switches.

•Term 4
- Ocean Creature
- Textiles
- 2D Shape to 3D shape

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

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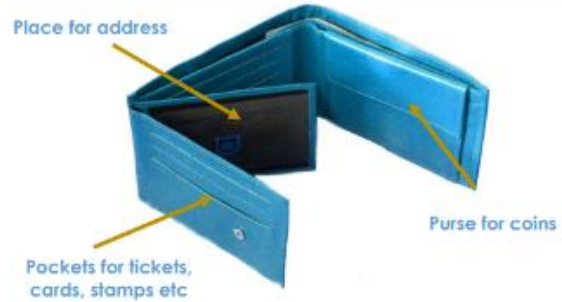
Years 3/4

Textiles

2-D shape to 3-D product

Instant CPD



Tips for teachers

- ✓ Have simple patterns available for children who may find it difficult to create their own.
- ✓ Demonstrate stitching techniques and have help sheets showing stitch instructions for the children to practise independently.
- ✓ Complete sewing practice in small groups. Use adult helpers to provide additional support. Possibly set up a rotation of activities.
- ✓ Demonstrate finishing techniques; let the children practise on small pieces of fabric.
- ✓ Have a limited range of fasteners.
- ✓ Use recycled fabrics e.g. old clothing, ensuring they are easy to work with.
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- ✓ Have a range of products and pictures for children to investigate. Try to use at least one product that can be disassembled so children can see all the parts.
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Back stitch


Backwards running stitch


Over sew stitch


Blanket stitch


Running stitch

Cutting out techniques


Ensure template is secured to fabric to allow for accuracy. Double sided tape can be used instead of pins to do this.


Place pattern pieces carefully to avoid wastage.

To move children's learning on, as enhancement activities, children could research into different types of fabrics and how they are constructed. They could carry out tests to check e.g. strength, waterproofness or flexibility to ensure their chosen fabric can be used to create a product that meets the needs of user and is fit for purpose.

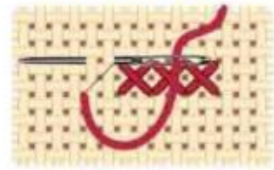

Bonded

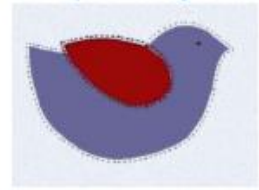

Woven


Knitted


Felted

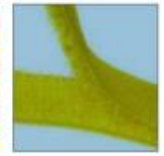
Decorative Techniques


Embroidery stitches e.g. cross-stitch


Appliqué by gluing or stitching

Possible fastenings


Buttons


Velcro

Designing, making and evaluating a holder/purse/wallet for a friend or relative

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
Who is it for? What will it hold? e.g. phone, money, plastic cards, pencils.	Discuss ideas; create a list of likes and dislikes of the user Generate design criteria
What shape will the holder be? How will it fasten?	Investigate a range of templates/patterns and choose the most appropriate one for purpose Create initial design ideas
What fabric should I use?	Discuss and explore different fabrics suitable for purpose Possibly test fabrics for strength/waterproofness
Which joining techniques would be the best for the fabric and pattern?	Discuss and test out different joining techniques on mock ups Evaluate these against the design criteria
How can I make my holder aesthetically pleasing for the user?	Test out a range of decorative techniques and decide on the one/s which are appropriate
How long will it take to make? What tools will I need? What order should I do it in?	Create the holder following the design
Reflection and refining What isn't working very well? What could I improve on?	Make suitable adjustment during the making process Develop the plan during the making
Will my holder/purse/wallet fulfill its function? Is it suitable for the user?	Test out the product Make an evaluation with the user against the initial design criteria and design ideas

Glossary

- **Appliqué** – means 'applied' - describes method of stitching/gluing patches onto fabric (originally to mend holes in worn clothes) to provide decoration.
- **Pattern/Template** – a shape drawn to exact shape and size and used to assist cutting out.
- **Seam** – a line of stitching that joins pieces of fabrics together.
- **Seam Allowance** – extra fabric allowed for joining together - usually 1.5cm.
- **Prototype** – a model that is made to test whether a design will work.
- **Aesthetics** – the way in which the product looks with the nature and expression of beauty.

•Term 5
- Pizza
- Food
- Healthy and Varied Diet

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Investigate and Evaluate	**Focused Tasks**	**Design**	**Make**	**Evaluate**
Children investigate a range of food products e.g. the content of their lunchboxes over a week, a selection of foods provided for them, food from a visit to a local shop. Link to the principles of a varied and healthy diet using The Eatwell Guide e.g. What ingredients have been used? Which food groups do they belong to? What substances are used in the products e.g. nutrients, water and fibre? • Carry out sensory evaluations on the contents of the food from e.g. a variety of bought food products such as a range of wraps or sandwiches. Record results, for example using a table. Use appropriate words to describe the taste/smell/texture/appearance e.g. How do the sensory characteristics affect your liking for the food? • Gather information about existing products available relating to your product. Visit a local supermarket and/or use the internet. • Find out how a variety of ingredients used in products are grown and harvested, reared, caught and processed e.g. Where and when are the ingredients grown? Where do different meats/fish/cheese/eggs come from? How and why are they processed?	Learn to select and use a range of utensils and use a range of techniques as appropriate to prepare ingredients hygienically including the bridge and claw technique, grating, peeling, chopping, slicing, mixing, spreading, kneading and baking. • Food preparation and cooking techniques could be practised by making a food product using an existing recipe. • Discuss basic food hygiene practices when handling food including the importance of following instructions to control risk e.g. What should we do before we work with food? Why is following instructions important?	Discuss the purpose of the products that the children will be designing, making and evaluating and who the products will be for. • Develop and agree on design criteria with the children within a context that is authentic and meaningful. This can include criteria relating to healthy eating and a varied diet e.g. What do you need to consider to make it part of a balanced diet? How do we select the ingredients? How could we make it appealing to eat? • Ask children to generate a range of ideas encouraging realistic responses. • Using discussion, annotated sketches and information and communication technology if appropriate, ask the children to develop and communicate their ideas.	Ask children to consider the main stages in making the food product, before preparing/cooking the product including the ingredients and utensils they will need. Make pizza	Evaluate as the assignment proceeds and the final product against the intended purpose and user, reflecting on the design criteria previously agreed. Consider what others think of the product when considering how the work might be improved.

Resources
information about foods from around the world, basic recipes, range of relevant, example foods to taste and evaluate, suitable equipment and utensils such as: knives, chopping board, weighing scales, measuring jugs, bowls, baking trays, spoons – various sizes, parchment paper, plastic film
Vocabulary
name of products, names of equipment, utensils, techniques and ingredients, texture, taste, sweet, sour, hot, spicy, appearance, smell, preference, greasy, moist, cook, fresh, savoury, hygienic, edible, grown, reared, caught, frozen, tinned, processed, seasonal, harvested, healthy/varied diet, planning, design criteria, purpose, user, annotated sketch, sensory evaluations

Years 3/4

Food
Healthy and varied diet

Instant CPD

Tips for teachers

- ✓ When choosing bought products to evaluate, choose some with simple fillings (such as cheese) and others with more variety (such as bacon, lettuce and tomato). Include some with fillings from a variety of cultures.
- ✓ Children may need help to develop design criteria for their product. You can model this by discussing what the design criteria may have been for an existing product that the children have previously evaluated before encouraging them to create their own.
- ✓ If you grow edible plants in the school grounds such as herbs, lettuce or tomatoes, encourage the children to use these in their food product. When possible, use some ingredients which are seasonal and locally sourced.
- ✓ It is advisable to have additional adult support when children are learning to prepare ingredients.
- ✓ Use a range of fresh and processed ingredients.
- ✓ Some ingredients can be cooked using a heat source with adult supervision to introduce children to techniques such as boiling an egg or roasting a pepper.
- ✓ Hygiene: tie long hair back, wear aprons, cover cuts with blue plasters and wash hands thoroughly with soap and dry with a paper towel. More details on www.foodafactoflife.org.uk.
- ✓ Homework idea 1: Ask children to collect pictures of related food products from magazines etc. Research which similar products are used around the world.
- ✓ Homework idea 2: Ask members of the children's family which is their favourite lunch snack and why.

Useful resources at www.data.org.uk

- Dips and Dippers
- Super Salads
- Sandwich Snacks
- Soups - Celebrating culture and seasonality

Other useful web-based resources:

- www.foodafactoflife.org.uk
- http://www.nhs.uk/livewell/5aday/pages/5adayhome.aspx

Wraps

Pitta bread sandwich

Sandwich

Skills and techniques

Grating cheese

Spreading butter on bread

Cutting using the bridge technique

Cutting using the claw technique

Investigating and Evaluating Activities

Children can analyse existing products related to their project using sensory evaluations and record their results in a table. Explain that tasting is not the same as eating. Provide kitchen towel so children can spit out food they do not like. Provide water to cleanse palette between tasting products.

Analysing existing products

Filling	Appearance	Smell	Flavour/ Taste	Texture	Dislike	Neither	Like
1							
2							
3							
4							
Word bank	Colourful Dark/pale Greasy Moist	Fruity Meaty Smoky Oniony Garlicky Fishy	Salty Herby Spicy Fishy Smoky	Crispy Crunchy Soft Chewy Sticky Smooth Hard			

Designing, making and evaluating a bread-based product with a filling for lunch, such as a wrap, a sandwich, a roll, a blini or a toastie

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
Who am I making the food product for? How can I make it appealing for the range of users?	Discussing and communicating ideas, researching existing products, drawing annotated sketches, generating design criteria.
What kind of food product shall I make that can be carried easily? What ingredients could it contain?	Referring back to sensory evaluations carried out in IEAs.
How will I make sure it looks appealing as well as tastes and smells good?	Discussing ideas and how the type of food product and way it is eaten will affect the design.
What techniques will I use to prepare the ingredients and what equipment do I need?	Peeling, chopping, slicing, grating, spreading. Using tools such as round ended knives, vegetable peelers, apple corers, strawberry hullers and graters. Listing the equipment required.
How long will it take? What order will I work in?	Planning the order of the activity and timescale.
More thoughts... appraising, reflecting and refining.	Acting on ongoing evaluation to make appropriate changes.
Has the snack met the needs of the user and achieved its purpose?	Evaluating the food product against the design criteria including the user and purpose. Recording final product through an annotated sketch.

Glossary

- **Appearance** – how the food looks to the eye.
- **Texture** – how the product feels in the mouth.
- **Sensory evaluation** – evaluating food products in terms of the taste, smell, texture and appearance.
- **Preference test** – trying different foods and deciding which you like best.
- **Strawberry huller** – tool to remove the stalk and leaves from a strawberry.
- **Processed food** – ingredients that have been changed in some way to enable them to be eaten or used in food preparation and cooking.

•Term 6
- Structures
- Shell Structures
- Packaging Design

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Children investigate a collection of different shell structures including packaging. Use questions to develop children's understanding e.g. What is the purpose of the shell structure – protecting, containing, presenting? What material is it made from? How has it been constructed? Are the materials recyclable or reusable? How has it been stiffened i.e. folded, corrugated, ribbed, laminated? What size/shape/colour is it? What information does it show and why? How attractive is the design? • Children take a small package apart identifying and discussing parts of a net including the tabs e.g. How are different faces of the package arranged? How are the tabs used to join the 'free' edges of the net? • Evaluate existing products to determine which designs children think are the most effective. Provide opportunities for the children to judge the suitability of the shell structures for their intended users and purposes. Discuss graphics including colours/impact of style/logo/size of font e.g. What do you prefer and why? What style of graphics and lettering might we want to include in our product to meet users' preferences and its intended purpose? Which packaging might be the best for…?	Children use kit parts with flat faces to construct nets. Practise making nets out of card, joining flat faces with masking tape to create 3-D shapes. Experiment with assembling in nets in numerous ways. • Demonstrate skills and techniques of scoring, cutting out and assembling using pre-drawn nets. Then allow children to practise by constructing a simple box. Show how a window could be cut out and acetate sheet added. • Demonstrate how to use different ways of stiffening and strengthening their shell structures e.g. folding and shaping, corrugating, ribbing, laminating. Provide opportunities for the children to practise these and to carry out tests to find out where their structures might need to be strengthened or stiffened. • Children discuss and explore the graphics techniques and media that could be used to achieve the desired appearance of their products. • Practise using computer-aided design (CAD) software to design the net, text and graphics for their products according to purposes	• Develop a design brief with the children within a context which is authentic and meaningful. • Discuss with the children the uses and purposes of their shell structures e.g. What does the product need to do? Who is it aimed at? How will the purpose and user affect your design decisions? Agree on design criteria that can be used to guide the development and evaluation of children's products e.g. How will we know that we have designed and made successful products? • Ask the children to use annotated sketches and prototypes to develop, model and communicate their ideas for the product e.g. What will you need to include in your design? How can you improve it? What materials will you use? How will you make sure your product works well and has the right appearance?	Ask children to identify the main stages of making and the appropriate tools and skills they learnt through focused tasks. Encourage the children to work with accuracy, using computer-aided design (CAD) where appropriate. Make	Make	Evaluate throughout and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

Resources
collection of shell structures for different purposes and users, card, squared paper, coloured paper, adhesive tape, masking tape, PVA glue, glue spreaders, acetate sheet, pencils, felt-tip pens, rulers, right/left-handed scissors, computer with computer aided design (CAD) software, printer
Vocabulary
shell structure, three-dimensional (3-D) shape, net, cube, cuboid, prism, vertex, edge, face, length, width, breadth, capacity marking out, scoring, shaping, tabs, adhesives, joining, assemble, accuracy, material, stiff, strong, reduce, reuse, recycle, corrugating, ribbing, laminating font, lettering, text, graphics, decision, evaluating, design briefdesign criteria, innovative, prototype

Years 3/4

Structures
Shell structures

Instant CPD



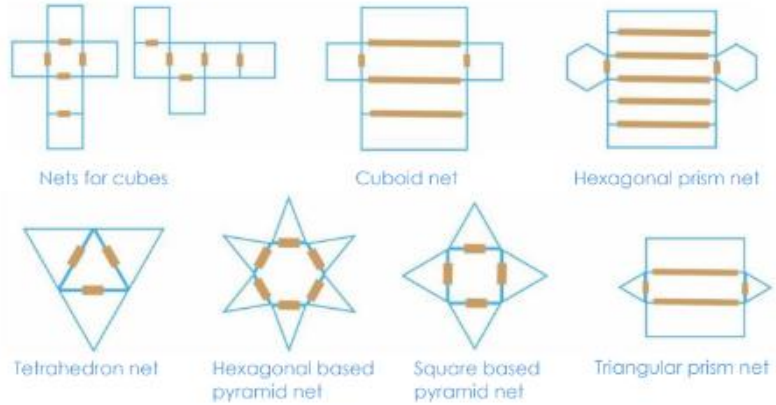
Tips for teachers

- ✓ Make a collection of boxes of various shapes and flatten them for storage.
- ✓ Discuss environmental issues relating to the wastage of materials when packaging items including the three R's – reducing, recycling and reusing.
- ✓ Visit a local shop or supermarket to investigate different types of card packaging.
- ✓ The use of an empty ball point pen together with a safety rule is ideal for scoring.
- ✓ The use of standard shapes as templates will help children design their own nets.
- ✓ Ensure that the children have sufficient tabs for assembling their nets.
- ✓ Consider the use of enlarge and reduce facilities on the photocopier when copying 2-D nets for the children as examples.
- ✓ Display technical vocabulary to encourage the children to use it when discussing, designing and making their product.
- ✓ Divide your class into teams and assign children to specific jobs within their teams e.g. Resources Manager, Sustainability Officer, Design Director, Tools Manager, Process Controller, Graphics Director.
- ✓ The use of computer-aided design to draw nets and graphics for the children's products could be practised in computing lessons.
- ✓ Ensure that the children have a good understanding of 2-D and 3-D shapes in maths before carrying out this project.

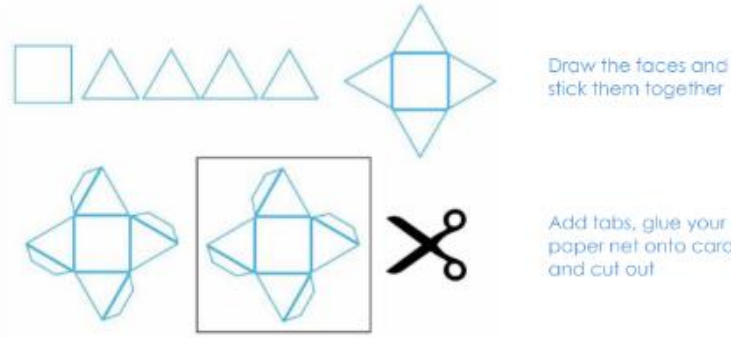
Useful resources at www.data.org.uk

- Primary Subject Leaders' File Section 5.9
- Banish broken biscuits! Box them brilliantly
- Working with Materials
- Packaging – with links to Maths
- Nets for packaging helpsheet
- Door hinges helpsheet

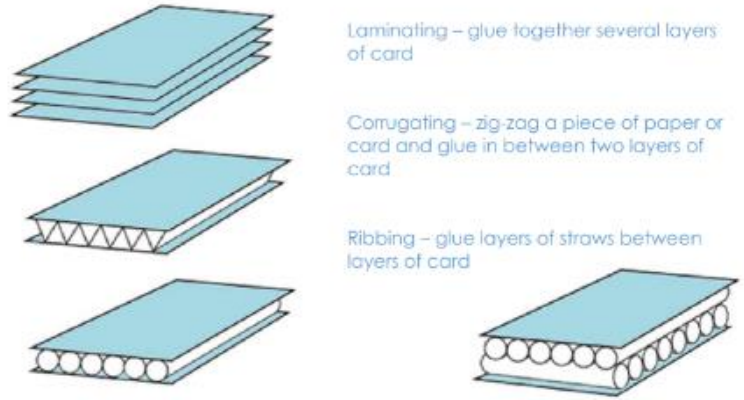
Assemble and evaluate 3-D shapes using standard sized card squares, rectangles, equilateral triangles, isosceles triangles and hexagons, joined with masking tape.



Creating the net for the product you are designing and making without using computer aided design:

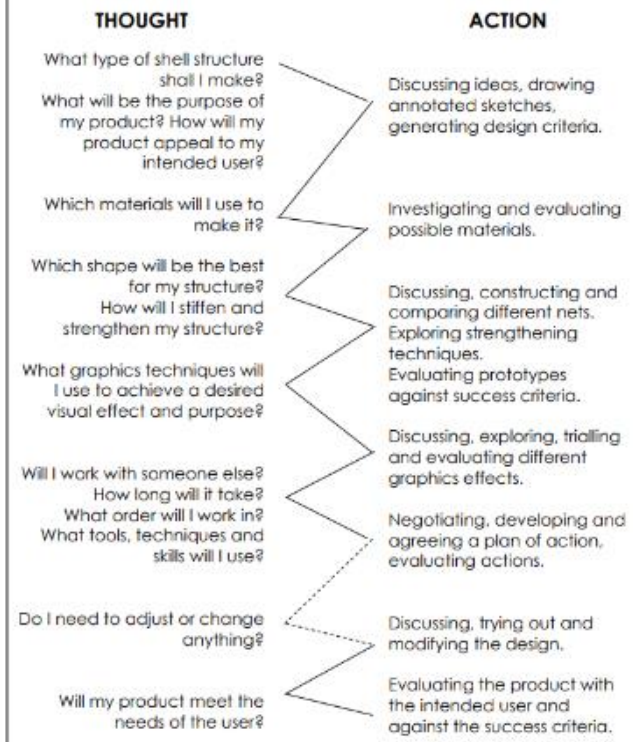


Stiffening and strengthening sheet materials:



Designing, making and evaluating packaging for a gift for a family member

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:



Glossary

- **Cuboid** – a solid body with rectangular sides.
- **Edge** – where two surfaces meet at an angle.
- **Face** – a surface of a geometric shape.
- **Font** – a printer's term meaning the style of lettering being used.
- **Net** – the flat or opened-out shape of an object such as a box.
- **Prism** – a solid geometric shape with ends that are similar, equal and parallel.
- **Scoring** – cutting a line or mark into sheet material to make it easier to fold.
- **Shell structure** – a hollow structure with a thin outer covering.
- **Vertex** – used to refer to the corners of a solid geometric shape, where edges meet.

Year 5

•Term 1
- Shell Structures
- Trade Game

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Review and evaluate a number of trading games based on how they are made.		Design a purposeful and appealing board game based on design criteria: trading in my local area	Generate, develop, model and communicate ideas for my game using talking, drawing and mockups. Test my game to ensure it is functional. Make	Make	Evaluate my design based on the views of others after test plays.

Resources
variety of board games for the children to assess and play and evaluate, instructions from board games for children to read and evaluate, PIT games, card, felt tips, photocopier to copy children's cards, pencils, net designs for children to create boxes from, rulers, scissors
Vocabulary
Trade, evaluate, game, instructions, design, Bristol, commodity, export, import, evaluate, products, net,

•Term 4
- Biome scene
- Textiles
- Combining different fabric shapes
- Aly Dalrymple

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Children investigate, analyse and evaluate a range of existing products which have been produced by combining fabric shapes. Investigate work by designers and their impact on fabrics and products. Use questions to develop children's understanding e.g. Is the product functional or decorative? Who would use this product? What is its purpose? What design decisions have been made? Do the textiles used match the intended purpose? What components have been used to enhance the appearance? To what extent is the design innovative? • Children investigate and analyse how existing products have been constructed. Children disassemble a product and evaluate what the fabric shapes look like, how the parts have been joined, how the product has been strengthen and stiffened, what fastenings have been used and why. • Children investigate properties of textiles through investigation e.g. exploring insulating properties, water resistance, wear and strength of textiles.	Develop skills of threading needles and joining textiles using a range of stitches. This activity must build upon children's earlier experiences of stitches e.g. improving appearance and consistency of stitches and introducing new stitches. If available, demonstrate and allow children to use sewing machines to join fabric with close adult supervision. • Develop skills of sewing textiles by joining right side together and making seams. Children should investigate how to sew and shape curved edges by snipping seams, how to tack or attach wadding or stiffening and learn how to start and finish off a row of stitches. • Develop skills of 2-D paper pattern making using grid or tracing paper to create a 3-D dipryl mock-up of a chosen product. Remind/teach how to pin a pattern on to fabric ensuring limited wastage, how to leave a seam allowance and different cutting techniques. • Develop skills of computer-aided design (CAD) by using on-line pattern making software to generate pattern pieces. Investigate using art packages on the computer to design prints that can be applied to textiles using iron transfer paper.	Set an authentic and meaningful design brief. Children generate ideas by carrying out research using e.g. surveys, interviews, questionnaires and the web. Children develop a simple design specification for their product. • Communicate ideas through detailed, annotated drawings from different perspectives and/or computer aided design. Drawings should indicate design decisions made, the methods of strengthening, the type of fabrics to be used and the types of stitching that will be incorporated. • Produce step-by-step plans, lists of tools equipment, fabrics and components needed. Allocate tasks within a team if appropriate.	Make high quality products applying knowledge, understanding and skills from IEAs and FTs. Incorporate simple computer-aided manufacture (CAM) if appropriate e.g. printing on fabric. Children use a range of decorating techniques to ensure a well-finished final product that matches the intended user and purpose. Make	Make	Evaluate both as the children proceed with their work and the final product in use, comparing the final product to the original design specification. Critically evaluate the quality of the design, the manufacture, functionality, innovation shown and fitness for intended user and purpose, considering others' opinions. Communicate the evaluation in various forms e.g. writing for a particular purpose, giving a well-structured oral evaluation, speaking clearly and fluently.

Resources
existing textile products for investigation and deconstruction linked to their product, wide selection of textiles including reclaimed and reusable fabrics, dipryl, pins, needles, thread, measuring tape, left/right handed fabric scissors, pinking shears, iron, iron transfer paper, sewing machine, range of fastenings, materials for insulating or strengthening e.g. bubble wrap, wadding, interfacing, finishing materials e.g. sequins, buttons, fabric paints
Vocabulary
seam, seam allowance, wadding, reinforce, right side, wrong side, hem, template, pattern pieces, name of textiles and fastenings used, pins, needles, thread, pinking shears, fastenings, iron transfer paper, design criteria, annotate, design decisions, functionality, innovation, authentic, user, purpose, evaluate, mock-up, prototype

Years 5/6

Textiles

Combining different fabric shapes

Instant CPD

Tips for teachers

- ✓ Choose fabrics carefully. Shiny, heavyweight or fabrics that fray easily are often difficult to work with and can be frustrating. Have fabric cut into manageable sizes.
- ✓ Investigate using materials other than fabrics e.g. for handles. Plastic bags can be cut into strips and plaited.
- ✓ To make the activity more manageable limit the choice of decorating techniques.
- ✓ Keep scissors for fabric only.
- ✓ Make sure that you have plenty of pins and needles for children to use.
- ✓ Arrange zones in the class where children will find materials and resources.
- ✓ Ensure children have a basic understanding of stitching techniques, threading needles, starting and finishing off.
- ✓ Make mock-ups, then alter and refine and go back to initial design ideas to amend as necessary e.g. change measurements. Ensure the children keep all their modifications as part of the ongoing evaluation and for their final evaluation.
- ✓ Enlist the help of a local textile designer if available.
- ✓ Children can make their own demonstration videos to show e.g. how to join in different ways or how to complete a range of stitches. Different groups could show how to do different tasks and then share them.
- ✓ If using sewing machines, either hand or electric, make sure that their use is very closely supervised, using, for example, trained adult volunteers. If this cannot be achieved, children can tack the fabric together and an adult can use the machine.

Useful resources at www.data.org.uk

- Designing with textiles
- Designer bags
- A to Z of D&T
- Working with Materials
- Butterflies in My Tummy

Teaching aids – fasteners

Children may want to use a fastener which should be appropriate for the purpose for the product.

Zip

Velcro

Clasp

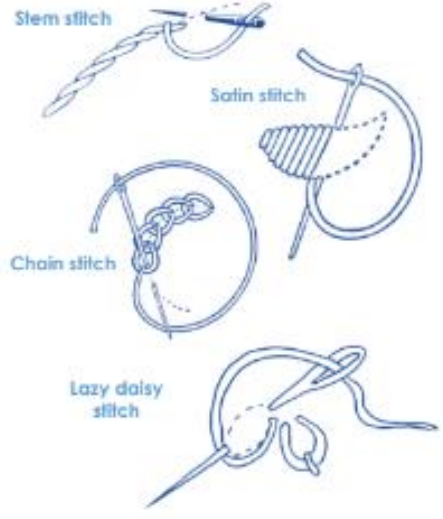
Toggles

Ties

Buttons

Press studs

Stitches



Using stitches as a finish for the product.

The children could design their finish for their product using a variety of appropriate stitches. They could draw enlarged examples of e.g. insects, flowers, animals and then decide which stitch would be best for each part. Use square paper for a grid to ensure the stitches are in the right place and are the right size.

Appliqué

Embroidery

Tie Dye

Children could decorate their fabric before they make up their product by tie dyeing.

The key to success is to tie the fabric very tightly with e.g. rubber bands or string so that the dye is prevented from reaching that part of the fabric.

Designing, making and evaluating a belt for garden tools

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:

THOUGHT	ACTION
What are the features of a successful product? What features do I need to include in a functional, innovative and authentic product?	Researching, investigating, disassembling and evaluating existing products and consulting 'real life' designers.
What knowledge and skills do I need to be able to design and make a good quality product?	Investigating and practising using a range of methods to join fabrics together and making judgments about the strength and appropriateness of each technique. Practising finishing techniques and, if possible, learning to use a sewing machine.
How do I make a paper pattern for the product I want to produce?	Creating a 2-D paper pattern with a seam allowance.
What design decisions do I need to make? How can I communicate my ideas for my product in an effective way?	Developing ideas through research, working drawings, computer-aided design, discussion, paper mock-ups and modelling.
How will I show innovation? Who will be the user of my product and what are their needs, wants and values? What will be the purpose of my product?	Thinking about the user and purpose and developing specifications for products. Formulating a clear plan of work and allocating tasks if appropriate.
More thoughts... appraising, reflecting, refining.	Constantly self-evaluating and making changes if the product is not fulfilling the specification.
Does my product meet the needs and wants of the user? Is it appealing and does it fulfil a purpose? Is it innovative?	Testing final products with the intended user and making an evaluation of how successful they are.

Glossary

- **Mock up** – quick 3-D modelling using easy to work and cheaper materials and temporary joints. Useful for checking proportions and scale.
- **Pattern or template** – a shape drawn to exact shape and size, used to assist in cutting out.
- **Seam allowance** – extra fabric allowed for joining together - 15mm for domestic patterns.
- **Specification** – describes what a product has to do.
- **Tacking** – large running stitches to hold pieces of fabric together temporarily.
- **Working drawing** – detailed drawing contains all information needed to make a product but is updated as changes are made.

•Term 5
- Vehicles
- Mechanical Systems
- Pulleys and Gears

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Investigate, analyse and evaluate existing everyday products and existing or pre-made toys that incorporate gear or pulley systems. Use videos and photographs of products that cannot be explored through first-hand experience. • Use observational drawings and questions to develop understanding of each product in the collection e.g. How innovative is the product? What design decisions have been made? What type of movement can be seen? What types of mechanical components are used and where are they positioned? What are the input, process and output of the system? How well does the product work? Why have the materials and components been chosen? How well has it been designed? How well has it been made? • Children could research and, if possible, visit engineering and manufacturing companies that are relevant to the product they are designing and making e.g. Jaguar Land Rover, JCB, local companies	Using a construction kit, investigate combinations of two different sized pulleys to learn about direction and speed of rotation e.g. How many times does the smaller pulley turn each time the larger pulley turns once? Do the pulleys move in the same direction? How can you reverse the direction of rotation? AND/OR • Using a construction kit, explore combinations of two different size gears meshed together. Investigate the direction and speed of rotation focusing on how the size of the driver gear affects the speed of the follower gear. Ask the children to use the number of teeth on each gear to decide upon the gear ratios e.g. 10 tooth driver gear meshed with a 20 tooth follower gear produces a ratio of 2:1 • Build a working circuit that incorporates a battery, a motor and a handmade switch, such as a reversing switch. Demonstrate the accurate use of tools and equipment including cutting and stripping wire, and making secure electrical connections. Remind children about the dangers of mains electricity. Draw a pictorial representation of the circuit or draw a circuit diagram using correct symbols. • Develop measuring, marking, cutting, shaping and joining skills using junior hacksaws, G-clamps, bench hooks, square section wood, card triangles and hand drills to construct wooden frames, as appropriate. Demonstrate the accurate use of tools and equipment.	Develop an authentic and meaningful design brief with the children. • Children generate innovative ideas by carrying out research including surveys, interviews and questionnaires and develop a design specification for their product, carefully considering the purpose and intended user for their product. • Communicate ideas through detailed, annotated drawings from different views and/or exploded diagrams. The drawings should indicate the design decisions made, including the location of the mechanical and electrical components, how they work as a system with an input, process and output, and the appearance and finishing techniques for the product. • Produce detailed step-by-step plans and lists of tools, equipment and materials needed. If appropriate allocate tasks within a team..	Make high quality products, applying knowledge, understanding and skills from IEAs and FTs. Children should use a range of decorative finishing techniques to ensure a well finished final product that matches the intended user and purpose. Make	Make	Evaluate throughout and the final product in use, comparing it to the original design specification. Critically evaluate the quality of the design, the manufacture, functionality, innovation shown and fitness for the intended user and purpose.

Resources

videos, photographs and everyday products or toys with pulleys or gears, batteries, battery holders, wires, crocodile clips, motors, switches, aluminium foil, paper fasteners, paper clips, card, motors, motor stands, dowel, paper, sticks consumable and construction kit pulleys or gears of different sizes, elastic bands, junior hacksaws, glass paper, G-clamps, bench hooks, hand drill, automatic wire strippers, PVA glue, sticky pads, masking tape, dowel, double-sided tape, card triangles, square section wood, card, corrugated plastic, finishing media

Vocabulary

pulley, drive belt, gear, rotation, spindle, driver, follower, ratio, transmit, axle, motor circuit, switch, circuit diagram, annotated drawings, exploded diagrams mechanical system, electrical system, input, process, output design decisions, functionality, innovation, authentic, user, purpose, design specification, design brief

Years 5/6

Mechanical systems
Pulleys or Gears

Instant CPD



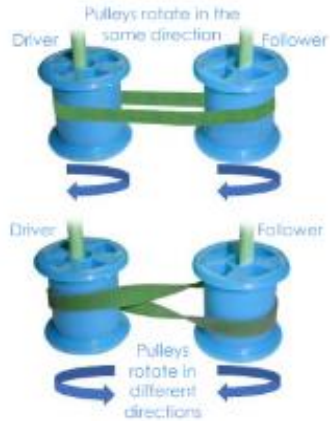
Tips for teachers

- ✓ Sourcing existing products with gears or pulleys can sometimes be difficult. Example products using construction kits or consumable materials can be premade for children to investigate.
- ✓ When beginning designing and making, ensure children are focused on making the mechanical system work, rather than the decoration.
- ✓ Focused tasks should concentrate on exploring combinations gears or pulleys using construction kits. If you do not have construction kits, attach bought pulleys and gears to cardboard using paper fasteners.
- ✓ Gears require more accuracy than pulleys at the making stage but make it easier for children to understand the concept of ratio by counting the number of teeth on each gear.
- ✓ The key to success in these units is to use components that are compatible with each other e.g. components purchased should have the same diameter holes.
- ✓ When children are making, zone areas of the classroom so resources can be easily found and replaced independently.
- ✓ Investigate alternative methods of evaluating. Try making video or photographic diaries that help develop ongoing evaluation.
- ✓ Don't be afraid of incorporating any failed designs into display of final products. Include evaluations of why designs didn't work and how children would make them work. This links to design in the real world and the concept that designs don't always work first time around.
- ✓ Do not use rechargeable, lithium or alkaline batteries as these can overheat if short circuited.

Useful resources at www.data.org.uk

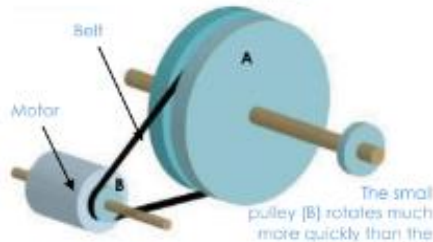
- Levers and Linkages
- Developing Handmade Switches
- Handmade Switches Helpsheet
- Gears and Pulleys
- Fairgrounds

Developing understanding of gears and pulleys



Using construction kits, ask children to explore gear ratio using combinations of two gears e.g.

No. teeth	Ratio
8, 16	2:1
8, 40	5:1
8, 24	3:1
40, 40	1:1

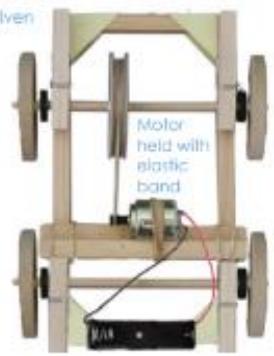


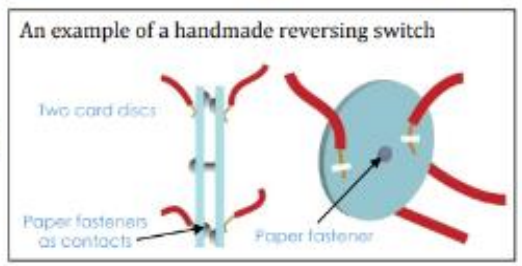
The small pulley (B) rotates much more quickly than the large pulley (A)

Building gears or pulleys into children's products

Construct a chassis using wooden strips (frame) or corrugated plastic. Add a pulley and/or wheels and an electric motor with battery housing.

The chassis can be used for a vehicle or to drive machines such as fairground rides.





Designing, making and evaluating a new toy vehicle for children in a particular age range

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:

THOUGHT	ACTION
What type of toy vehicle shall I make? What will be its purpose? Who will use it?	Discussing ideas, drawing annotated sketches or exploded diagrams. Generating a simple design specification.
What electrical and mechanical components shall I use?	Discussing, modelling and evaluating different systems using mechanical and electrical components.
Which materials will I use to make it? How will I make fit for purpose?	Investigating and trialling possible materials and components.
How will I make the body shell for my toy vehicle?	Discussing, exploring and evaluating prototypes.
What tools and materials will I need? What order will I work in? What constraints am I working to?	Negotiating, developing and agreeing a step-by-step-plan.
Do I need to change anything?	Discussing, testing and modifying the design.
Will my product meet the needs, wants and interests of the user group?	Evaluating the product with the intended user group and against the original design specification.

Glossary

- **Pulley** – a grooved wheel over which a drive belt can run.
- **Gear** – a wheel with teeth around its circumference.
- **Drive belt** – the belt which connects and transfers movement between two pulleys.
- **Gearing up or down** – changing the rotational speed of a product by the use of pulleys or gears. When a small pulley or gear is used to drive a larger one the rotational speed is reduced and the product has been geared down.
- **Mechanical system** – a set of related parts or components used to create movement.
- **Driver** – the gear or pulley that provides the input movement to the system.
- **Follower** – the gear or pulley that provides the output movement to the system.
- **Mesh** – the point where two gears join together and transfer movement.
- **Motor spindle** – the rod on the end of the motor onto which a gear or pulley is attached.

•Term 5
- Biscuits
- Food
- Celebrating Culture and seasonality

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Investigate and Evaluate	**Focused Tasks**	**Design**	**Make**	**Evaluate**
• Children use first hand and secondary sources to carry out relevant research into existing products to include personal/cultural preferences, ensuring a healthy diet, meeting dietary needs and the availability of locally sourced/seasonal/organic ingredients. This could include a visit to a local bakery, farm, farm shop or supermarket e.g. What ingredients are sourced locally/in the UK/from overseas? What are the key ingredients needed to make a particular product? How have ingredients been processed? What is the nutritional value of a product? • Children carry out sensory evaluations of a variety of existing food products and ingredients relating to the project. The ingredients could include those that could be added to a basic recipe such as herbs, spices, vegetables or cheese. These could be locally sourced, seasonal, Fair Trade or organic. Present results in e.g. tables/graphs/charts and by using evaluative writing. • Use a range of questions to support children's ability to evaluate food ingredients and products e.g. What ingredients help to make the product spicy/crisp/crunchy etc? What is the impact of added ingredients/finishes/shapes on the finished product? • Research key chefs and how they have promoted seasonality, local produce and healthy eating.	Demonstrate how to measure out, cut, shape and combine e.g. knead, beat, rub and mix ingredients. • Demonstrate how to use appropriate utensils and equipment that the children may use safely and hygienically. • Techniques could be practised following a basic recipe to prepare and cook a savoury food product. • Ask questions about which ingredients could be changed or added in a basic recipe such as types of flour, seeds, garlic, vegetables. Consider texture, taste, appearance and smell. • When using a basic dough recipe, explore making different shapes to change the appearance of the food product e.g. Which shape is most appealing and why?	• Develop a design brief and simple design specification with the children within a context that is authentic and meaningful. This can include design criteria relating to nutrition and healthy eating. • Discuss the purpose of the products that the children will be designing, making and evaluating and who the products will be for. • Ask children to generate a range of ideas encouraging innovative responses. Agree on design criteria that can be used to guide the development and evaluation of the children's product. • Using annotated sketches, discussion and information and communication technology if appropriate, ask children to develop and communicate their ideas.	• Ask children to record the steps, equipment, utensils and ingredients for making the food product drawing on the knowledge, understanding and skills learnt through IEAs and FTs. Make	• Evaluate the work as it progresses and the final product against the intended purpose and user reflecting on the design specification previously agreed.

Resources
information about food from around the world, video clips of foods in the context of where they come from, range of relevantexamples of foods to taste and evaluate, basic recipes, suitable equipment and utensils to make and cook recipes such as: weighing scales, measuring jugs, bowls, spoons – various sizes, baking trays, parchment paper, plastic film
Vocabulary
ingredients, yeast, dough, bran, flour, wholemeal, unleavened, baking soda, spice, herbs fat, sugar, carbohydrate, protein, vitamins, nutrients, nutrition, healthy, varied, gluten, dairy, allergy, intolerance, savoury, source, seasonality utensils, combine, fold, knead, stir, pour, mix, rubbing in, whisk, beat, roll out, shape, sprinkle, crumble design specification, innovative, research, evaluate, design brief

Years 5/6

Food

Celebrating culture and seasonality

Instant CPD

Tips for teachers

- ✓ When rubbing in flour and fat, keep ingredients and hands cool.
- ✓ The purpose of kneading bread is to strengthen the gluten (the protein in grain such as wheat). It normally takes about 10-12 minutes by hand. When ready the dough will be smooth, elastic and hold its shape.
- ✓ When developing a product e.g. soup, that requires chopping and slicing of ingredients refer to the Y3/4 Food Project Planner.
- ✓ Limit the number of ingredients added to the basic recipe and discuss when is the best time to add the new or changed ingredient(s).
- ✓ Emphasise the importance of accurate weighing and measuring.
- ✓ Some supermarkets and bakeries will allow children to visit. This could be linked to an enterprise project with a class-based food company.
- ✓ Children could design packaging for their food products as part of work on structures linked to mathematics.
- ✓ Carry out a survey to find out which cultural/seasonal food products are preferred by family and friends.
- ✓ For homework, encourage children to grow edible plants such as herbs.

Useful resources at www.data.org.uk

- Christmas Ginger Biscuits
- Willy Wonka's Fair Trade Cookies
- Making Bread using the Six Essentials
- Are you Teaching Food in Primary D&T?
- A to Z of D&T
- Make it Safe!

Other useful web-based resources:

- www.foodafactoflife.org.uk

Possible products

Biscuits

Savoury scones

Savoury muffins

Possible techniques that children could use

Mixing to combine ingredients if making savoury muffins or scones

Rubbing in to mix fat and flour if making a yeast-based product

Kneading a bread dough

Sensory evaluation

When carrying out sensory evaluations of products and/or separate ingredients, begin with a whole class activity then use group work to develop ideas.

Example of a recording table:

Type of cultural/seasonal food product	Appearance	Smell	Texture	Taste
Savoury scone	Golden/rough	Fresh/baked	Crumbly	Cheesy

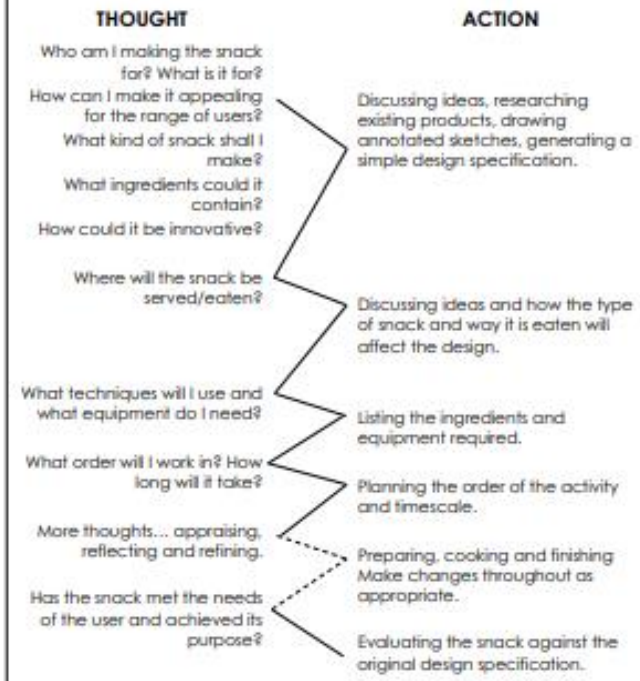
Children can also use simple ranking and rating tables as well as star diagrams.

Use packaging and/or the internet to find out about the nutritional content of the food products and the ingredients. Link this to the principles of a healthy and varied diet.

Edible plants grown in the school grounds can also be evaluated and considered as potential ingredients for products the children will later design, make and evaluate. The benefits/difficulties of selecting seasonal, organic and/or locally sourced ingredients can be discussed here.

Designing, making and evaluating a yeast-based snack for parents and children participating in the school sports day

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:



Glossary

- **Finishing** – related to the appearance of the product – shape, decoration and colour.
- **Rubbing in** – rubbing the dry ingredients together with the fat, lifting to put air into the mixture, so that it resembles fine breadcrumbs.
- **Knead** – pulling and squeezing dough to make it smooth.
- **Bran** – the hard, protective shell of a grain of wheat.
- **Dough** – a mixture of flour, yeast and water before it is cooked.
- **Endosperm** – the store of food inside a seed.
- **Germ** – part of the seed where the root and shoots grow from.
- **Yeast** – a tiny plant which makes bubbles of carbon dioxide when mixed with flour and warm water.
- **Unleavened bread** – flat bread where yeast has not been added.

•Term 6
- Birdhouse
- Structures
- Frame Structures

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Children investigate and make annotated drawings of a range of portable and permanent frame structures, e.g. tents, bus shelters, umbrellas. Use photographs and web-based research to extend the range e.g. How well does the frame structure meet users' needs and purposes? Why were materials chosen? What methods of construction have been used? How has the framework been strengthened, reinforced and stiffened? How does the shape of the framework affect its strength? How innovative is the design? When was it made? Who made it? Where was it made? • Children could research key events and individuals related to their study of frame structures e.g. Stephen Sauvestre – a designer of the Eiffel Tower; Thomas Farnolls Pritchard – designer of the Iron Bridge. They could also learn about locally important design and technology activity related to their project.	• Use a construction kit consisting of plastic strips and paper fasteners to build 2-D frameworks. Compare the strength of square frameworks with triangular frameworks. Ask the children to reinforce square frameworks using diagonals to help develop an understanding of using triangulation to add strength to a structure. • Demonstrate how paper tubes can be made from rolling sheets of newspaper diagonally around pieces of e.g. dowel. Ask children to use these tubes and masking tape or paper straws with pipe cleaners to build 3-D frameworks such as cubes, cuboids and pyramids. How could each of the frameworks be reinforced and strengthened? • Demonstrate the accurate use of tools and equipment. Develop skills and techniques using junior hacksaws, G-clamps, bench hooks, square section wood, card triangles and hand drills to construct wooden frames, as appropriate. • Demonstrate skills and techniques for accurately joining framework materials together e.g. paper straws, square sectioned wood. Ask children to practise these, mounting their joints onto card for future reference	• Discuss the brief of designing and making a small-scale frame structure e.g. Who is the intended user and what is the purpose of the frame structure? Will it be permanent, or can it be easily dismantled? What materials will you use? How will it be joined? How will it be reinforced? How will it be finished? Children should be encouraged to generate innovative ideas, drawing on their research. Ask children to develop a simple design specification to guide their thinking. • Children should produce a detailed, step-by-step plan, listing tools and materials. • Children's sketches should be annotated with notes to help develop and communicate their ideas.	Encourage children to model their ideas first using materials such as paper, card and paper straws e.g. How will you make it stable? How will it stand up? How could you make it stronger? Where are the weak points? How could you reinforce them? What tools and materials will you need? How can you improve the design? Make	Make	Encourage children to make their products with accuracy. They should regularly evaluate their work and their completed product, drawing on their design specification, and thinking about the intended purpose and user.

Resources
products, photographs, web-based resources of existing frame structures card, paper straws, newspaper, square sectioned wood, masking tape, PVA glue pencils, rulers, right/left-handed scissors, objects to use as bird houses e.g. milk cartons, oat milk cartons etc. Decorations e.g. sequins, natural materials e.g. twigs, bench hooks, G-clamp, junior hacksaws, glass paper finishing media and materials
Vocabulary
frame structure, stiffen, strengthen, reinforce, triangulation, stability, shape, join, temporary, permanent design brief, design specification, prototype, annotated sketch, purpose, user, innovation, research, functional

Years 5/6

Structures
Frame structures

Instant CPD

Tips for teachers

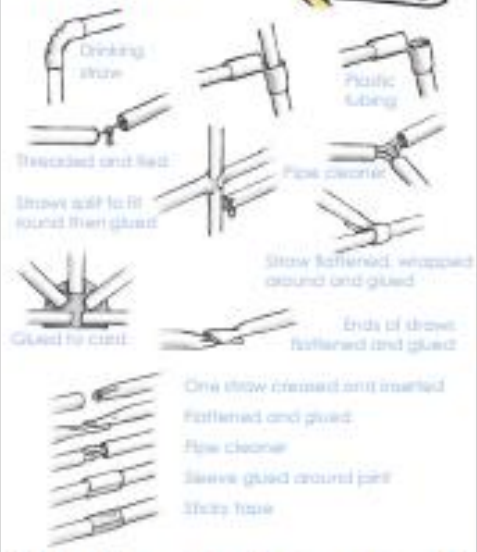
- ✓ Collect a range of photographs of different frame structures, both portable and permanent e.g. tents, bus shelters, bird hides.
- ✓ Include examples constructed with external and internal frameworks.
- ✓ Record the process of investigating frame structures using photographs and annotated drawings.
- ✓ Take children on a local 'frame structures' trail to help them get ideas for their own products and understand construction techniques.
- ✓ Frame structures for large scale shelters can be made from broom sticks, garden canes or rolls of newspaper.
- ✓ Ensure children are familiar with all the materials they are likely to use and that these are made easily available and accessible.
- ✓ Discuss constraints such as time, resources and cost.
- ✓ Display technical vocabulary and encourage children to use it when discussing, designing and making their product.
- ✓ Ensure children use simple tests to evaluate the functionality and strength of their products.
- ✓ Encourage the children to evaluate each other's work positively.

Useful resources at www.data.org.uk

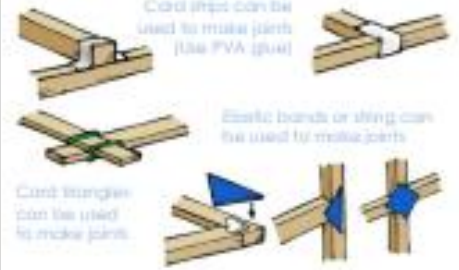
- Primary Subject Leaders' File Section 5.9
- Bird Hides Design and Make Challenge

Techniques for building frame structures

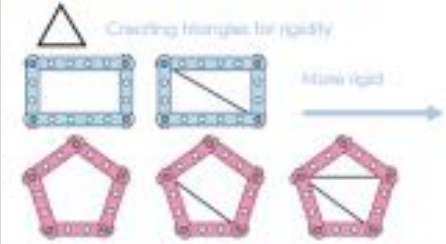
Joining straws



Joining thin sectioned pieces of wood

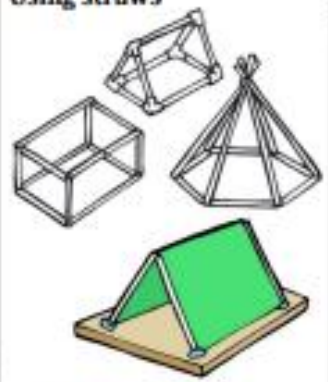


Understanding triangulation

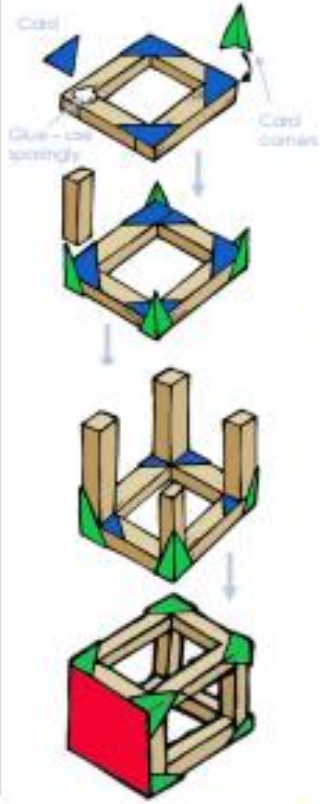


Making small-scale frame structures

Using straws



Using square section wood



Designing and making a small-scale bird hide for children to use in the school wildlife area

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:

THOUGHT	ACTION
What type of structure shall I make? What will be its purpose? Who will use it?	Discussing ideas, drawing annotated sketches. Generating a simple design specification.
Which will be the best shape for my bird hide? What features will it have?	Discussing, modelling and evaluating different options.
Which materials will I use to make it? How will I make it strong and waterproof?	Investigating and testing possible materials. Discussing, exploring and evaluating prototypes.
What will I use to cover the structure of my shelter?	Discussing, exploring and evaluating different fabric and rigid covering options.
What tools and materials will I need? What order will I work in? Will I work with someone? What constraints I am working to?	Negotiating, developing and agreeing a step-by-step plan.
Do I need to change anything?	Discussing, testing and modifying the design.
Will my product meet the needs of the user?	Evaluating the product with the intended user and against the original design specification.

Glossary

- **Modelling** – the process of making a 3-D representation of a structure or product.
- **Compression** – the application of pressure to squeeze an object.
- **Strut** – a part of a structure under compression.
- **Tension** – a force pulling on a material or structure.
- **Tie** – a part of a structure under tension.
- **Diagonal** – a straight line that goes from one corner to another inside a shape.
- **Horizontal** – a line that is parallel to the ground.
- **Vertical** – a line that is at right angles to the ground.
- **Triangulation** – the use of triangular shapes to strengthen a structure.
- **Frame structure** – a structure made from thin components e.g. tent frame.

Year 6

•Term 3
- Industrial Revolution
- Mechanical System
- Cams

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Discuss with the children different types of movement: rotary, oscillating and reciprocating. Make simple models of different types of cams or have toys in which the cam mechanisms can be seen. Use videos, photographs and computer animations of products that cannot be explored through first-hand experience. • Encourage children to look for different types of movement in the home and in school. • Use observational drawings and questions to develop understanding of the products in the handling collection and those that children have researched e.g. How innovative is the product? What design decisions have been made? What type of movement can be seen? What types of mechanical components are used and where are they positioned? What are the input movement, process and output movement of the system? How well does the product work? Why have the materials and components been chosen? How well has it been designed? How well has it been made? • Children could research and, if possible, visit engineering and manufacturing companies that are relevant to the product they are designing and making e.g. car engine manufacturers	Give children pre-cut cams made from MDF or wooden wheels to mount on a piece of board and observe their movement with a follower. • Demonstrate how to use a hand drill safely to make an off-centre cam and position it accurately in a housing. Ensure children secure the wheel with a G-clamp and use a piece of scrap wood under the wheel to avoid drilling through the bench hook or table. Stress the importance of measuring accurately and checking before cutting any holes or gluing. It is important to line up the cam and follower otherwise the mechanism may not work smoothly. How high will the cam lift the follower? • Develop measuring, marking, cutting, shaping and joining skills using junior hacksaws, G-clamps, bench hooks, square section wood, card triangles and hand drills to make cam mechanisms and construct wooden frames or card housings, as appropriate. Demonstrate the accurate and safe use of tools and equipment.	Develop an authentic and meaningful design brief with the children. • Children generate innovative ideas by carrying out research including surveys, interviews and questionnaires and develop a design specification for their product, carefully considering the purpose and intended user for their product. • Communicate ideas through detailed, annotated sketches from different views and/or exploded diagrams. The drawings should indicate the design decisions made, including the location of the components, how they work as a system and the appearance and finishing techniques for the product. • Produce detailed step-by-step plans and lists of tools, equipment and materials needed. If appropriate, allocate tasks within a team..	Make high quality products, applying knowledge, understanding and skills from IEAs and FTs. Children should use a range of decorative finishing techniques to ensure a well finished final product that matches the intended user and purpose. Make	Make	Evaluate throughout and the final product in use, comparing it to the original design specification. Critically evaluate the quality of the design, the manufacture, functionality, innovation shown and fitness for the intended user and purpose.

Resources

videos and photographs of cams, models or toys with different cam mechanisms, MDF, card or wooden wheels, plastic or wooden cams, dowel, card boxes, PVA glue, masking tape, double-sided tape, square section wood, card, corrugated plastic, finishing media, junior hacksaws, glass, paper, G-clamps, bench hooks, hand drill

Vocabulary

cam, snail cam, off-centre cam, peg cam, pear shaped cam, follower, axle, shaft, crank, handle, housing, framework rotation, rotary motion, oscillating motion, reciprocating motion, annotated sketches, exploded diagrams mechanical system, input, movement, process, output movement, design decisions, functionality, innovation, authentic, user, purpose, design specification, design brief

Years 5/6

Mechanical systems
Cams

Instant CPD

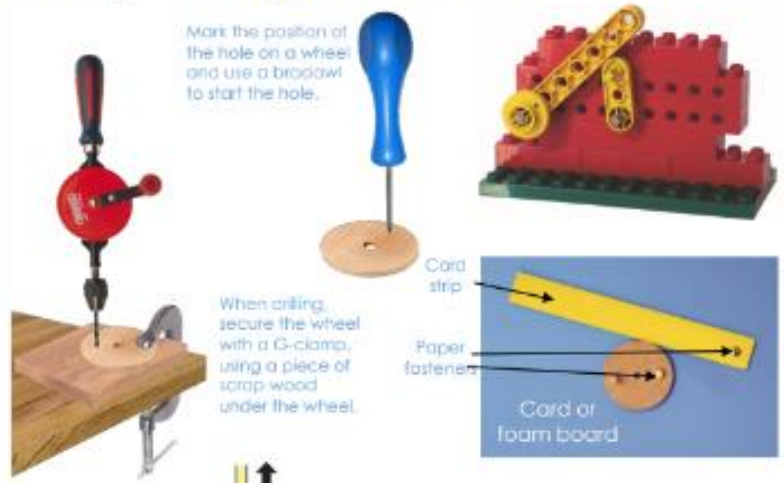
Tips for teachers

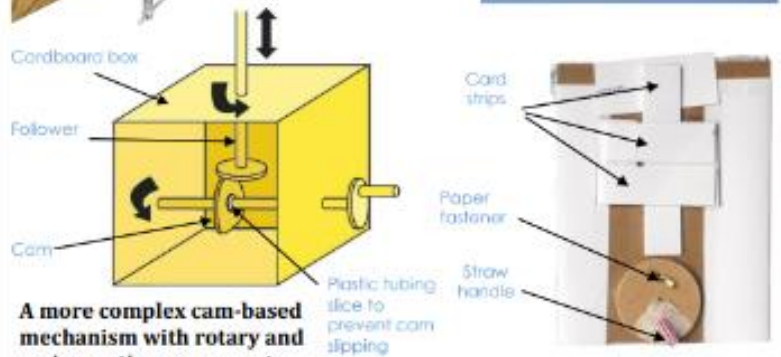
- Finding existing products that have cams on show can be difficult and they may have to be deconstructed to show the parts. Make example products using construction kits or consumable materials for children to investigate.
- Easy teaching aids can be made by mounting wheels on cardboard, foam board or corrugated plastic sheet. Card or foam wheels are easy to cut to different shapes.
- Avoid decorating teaching aids as this can influence the children's designs. Encourage discussion about what could move up and down and in rotation.
- Use pre-drilled wheels if time is limited and children have already had experience of using a hand drill.
- When making a cam and lever mechanism, remember the distance between the cam and the pivot point of the lever will affect the amount of movement, with more movement close to the pivot.
- When making a cam and slider mechanism, position the cam, slider and guides correctly. Measure where the cam will go to at the base of its cycle so that it does not overlap the bottom of the board. The guides should be positioned so that there is enough clearance for the cam to turn at the top of its cycle.
- When children are making, zone areas of the classroom so resources can be easily found and replaced independently.
- Investigate alternative methods of evaluating. Try making video or photographic diaries that help develop ongoing evaluation.
- Don't be afraid to include any failed designs into displays of final products. Include evaluations of why the designs didn't work and how children would make them work. This links to design in the real world and the concept that designs don't always work first time around.

Useful resources at www.data.org.uk

- Primary Subject Leaders' File Section 5.8
- Levers and Linkages
- Working with wheels and axles
- Mechanisms with a message
- Gears and Pulleys
- Fairgrounds

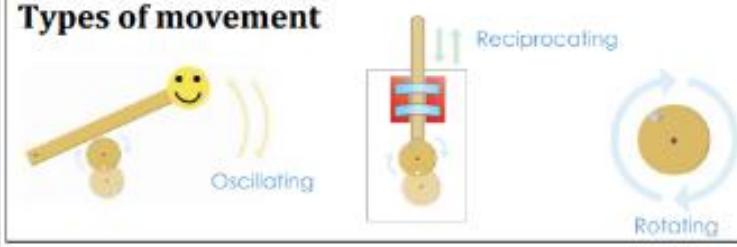
Making teaching aids to demonstrate cams



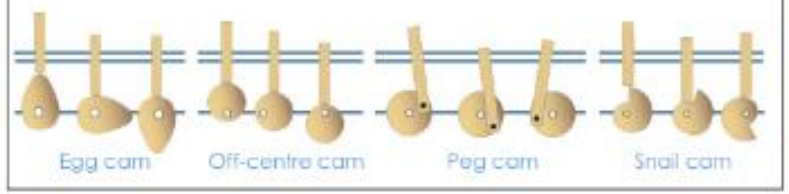


A more complex cam-based mechanism with rotary and reciprocating movement.

Types of movement



Types of cams



Designing, making and evaluating a moving toy for children in a particular age range

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
What type of moving toy shall I make? What will be its purpose? Who will use it?	Discussing ideas, drawing annotated sketches or exploded diagrams Generating a simple design specification
What type of movement will it have? Will it be a moving vehicle or be stationary and have moving parts?	Discussing, modelling and evaluating different systems using mechanical components
Which materials will I use to make it? How will I make it fit for purpose?	Investigating and trialling possible materials and components
How will I make the body or housing for the moving parts?	Discussing, exploring and evaluating prototypes
What tools and materials will I need? What order will I work in? What constraints am I working to?	Negotiating, developing and agreeing a step-by-step plan
Do I need to change anything?	Discussing, testing and modifying the design
Will my product meet the needs, wants and interests of the user group?	Evaluating the product with the intended user group and against the original design specification

Glossary

- **Rotary motion** – movement that goes round.
- **Oscillating motion** – moving to and fro around a pivot point, as in a lever.
- **Reciprocating motion** - backwards and forwards movement in a straight line, as in a slider.
- **Cam** – a mechanism that changes one sort of movement to another. Cams can be an off-centre wheel or a specially shaped wheel.
- **Follower** – the device that follows the movement of the cam: a lever or a slider.
- **Lever** – a piece of rigid material that moves to and fro around a pivot point creating oscillating motion.
- **Slider** – a piece of rigid material that moves backwards and forwards in a straight line creating reciprocating motion.
- **Guide** – a piece of material used to guide the movement of another.
- **Spacer** – a piece of material used to create extra space to allow moving parts to move freely.

•Term 6
- Scones
- Food
- Celebratiing Culture and Seasonality

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Investigate and Evaluate	Focused Tasks	Design	Make	Evaluate
Children use first hand and secondary sources to carry out relevant research into existing products to include personal/cultural preferences, ensuring a healthy diet, meeting dietary needs and the availability of locally sourced/seasonal/organic ingredients. This could include a visit to a local bakery, farm, farm shop or supermarket e.g. What ingredients are sourced locally/in the UK/from overseas? What are the key ingredients needed to make a particular product? How have ingredients been processed? What is the nutritional value of a product? • Children carry out sensory evaluations of a variety of existing food products and ingredients relating to the project. The ingredients could include those that could be added to a basic recipe such as herbs, spices, vegetables or cheese. These could be locally sourced, seasonal, Fair Trade or organic. Present results in e.g. tables/graphs/charts and by using evaluative writing. • Use a range of questions to support children's ability to evaluate food ingredients and products e.g. What ingredients help to make the product spicy/crisp/crunchy etc? What is the impact of added ingredients/finishes/shapes on the finished product? • Research key chefs and how they have promoted seasonality, local produce and healthy eating.	Demonstrate how to measure out, cut, shape and combine e.g. knead, beat, rub and mix ingredients. • Demonstrate how to use appropriate utensils and equipment that the children may use safely and hygienically. • Techniques could be practised following a basic recipe to prepare and cook a savoury food product. • Ask questions about which ingredients could be changed or added in a basic recipe such as types of flour, seeds, garlic, vegetables. Consider texture, taste, appearance and smell. • When using a basic dough recipe, explore making different shapes to change the appearance of the food product e.g. Which shape is most appealing and why?	Develop a design brief and simple design specification with the children within a context that is authentic and meaningful. This can include design criteria relating to nutrition and healthy eating. • Discuss the purpose of the products that the children will be designing, making and evaluating and who the products will be for. • Ask children to generate a range of ideas encouraging innovative responses. Agree on design criteria that can be used to guide the development and evaluation of the children's product. • Using annotated sketches, discussion and information and communication technology if appropriate, ask children to develop and communicate their ideas.	Ask children to record the steps, equipment, utensils and ingredients for making the food product drawing on the knowledge, understanding and skills learnt through IEAs and FTs Make	• Evaluate the work as it progresses and the final product against the intended purpose and user reflecting on the design specification previously agreed.

Resources
information about food from around the world, video clips of foods in the context of where they come from, range of relevant examples of foods to taste and evaluate, basic recipes, suitable equipment and utensils to make and cook recipes such as: weighing scales, measuring jugs, bowls, spoons –various sizes, baking trays, parchment paper, plastic film
Vocabulary
ingredients, yeast, dough, bran, flour, wholemeal, unleavened, baking soda, spice, herbs, fat, sugar, carbohydrate, protein, vitamins, nutrients, nutrition, healthy, varied, gluten, dairy, allergy, intolerance, savoury, source, seasonality, utensils, combine, fold, knead, stir, pour, mix, rubbing in, whisk, beat, roll out, shape, sprinkle, crumble, design specification, innovative, research, evaluate, design brief

Years 5/6

Food

Celebrating culture and seasonality

Instant CPD

Tips for teachers

- ✓ When rubbing in flour and fat, keep ingredients and hands cool.
- ✓ The purpose of kneading bread is to strengthen the gluten (the protein in grain such as wheat). It normally takes about 10-12 minutes by hand. When ready the dough will be smooth, elastic and hold its shape.
- ✓ When developing a product e.g. soup, that requires chopping and slicing of ingredients refer to the Y3/4 Food Project Planner.
- ✓ Limit the number of ingredients added to the basic recipe and discuss when is the best time to add the new or changed ingredient(s).
- ✓ Emphasise the importance of accurate weighing and measuring.
- ✓ Some supermarkets and bakeries will allow children to visit. This could be linked to an enterprise project with a class-based food company.
- ✓ Children could design packaging for their food products as part of work on structures linked to mathematics.
- ✓ Carry out a survey to find out which cultural/seasonal food products are preferred by family and friends.
- ✓ For homework, encourage children to grow edible plants such as herbs.

Useful resources at www.data.org.uk

- Christmas Ginger Biscuits
- Willy Wonka's Fair Trade Cookies
- Making Bread using the Six Essentials
- Are you Teaching Food in Primary D&T?
- A to Z of D&T
- Make it Safe!

Other useful web-based resources:

- www.foodafactoflife.org.uk

Possible products

Biscuits | Savoury scones | Savoury muffins

Possible techniques that children could use

Mixing to combine ingredients if making savoury muffins or scones

Rubbing in to mix fat and flour if making a yeast-based product

Kneading a bread dough

Sensory evaluation

When carrying out sensory evaluations of products and/or separate ingredients, begin with a whole class activity then use group work to develop ideas.

Example of a recording table:

Type of cultural/seasonal food product	Appearance	Smell	Texture	Taste
Savoury scone	Golden/rough	Fresh/baked	Crumbly	Cheesy

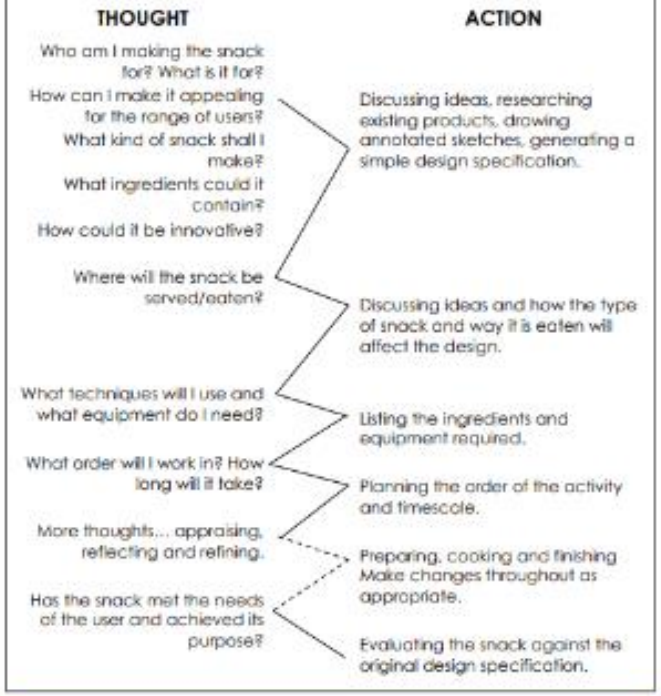
Children can also use simple ranking and rating tables as well as star diagrams.

Use packaging and/or the internet to find out about the nutritional content of the food products and the ingredients. Link this to the principles of a healthy and varied diet.

Edible plants grown in the school grounds can also be evaluated and considered as potential ingredients for products the children will later design, make and evaluate. The benefits/difficulties of selecting seasonal, organic and/or locally sourced ingredients can be discussed here.

Designing, making and evaluating a yeast-based snack for parents and children participating in the school sports day

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:



Glossary

- **Finishing** – related to the appearance of the product – shape, decoration and colour.
- **Rubbing in** – rubbing the dry ingredients together with the fat, lifting to put air into the mixture, so that it resembles fine breadcrumbs.
- **Knead** – pulling and squeezing dough to make it smooth.
- **Bran** – the hard, protective shell of a grain of wheat.
- **Dough** – a mixture of flour, yeast and water before it is cooked.
- **Endosperm** – the store of food inside a seed.
- **Germ** – part of the seed where the root and shoots grow from.
- **Yeast** – a tiny plant which makes bubbles of carbon dioxide when mixed with flour and warm water.
- **Unleavened bread** – flat bread where yeast has not been added.

•Term 6

- Car alarm
- Electrical Systems
- More Complex Switches and Systems

Teacher uses blocks 5 – 9 to decide project title: product, user and purpose

Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Investigate and Evaluate	Focused Tasks	Design	Make	Make	Evaluate
Using research, discuss a range of relevant products that respond to changes in the environment using a computer control program such as automatic nightlights, alarm systems, security lighting e.g. Who have the products been designed for and for what purpose? How and why is a computer control program used to operate the products? What input devices, e.g. switches, and output devices, e.g. bulbs, have been used? • Investigate electrical sensors such as light dependent resistors (LDRs) and a range of switches such as push-to-make switches, push-to-break switches, toggle switches, micro switches and reed switches. To gain an understanding of how they are operated by the user and how they work, ask the children to use each component to control a bulb in a simple circuit. Remind children about the dangers of mains electricity. • Children could research famous inventors related to the project e.g. Thomas Edison – light bulb	Through teacher demonstration and explanation, recap measuring, marking out, cutting and joining skills with construction materials that children will need to create their electrical products. • Demonstrate and enable children to practise methods for making secure electrical connections e.g. using automatic wire strippers, twist and tape electrical connections, screw connections and connecting blocks. • Drawing on science understanding, ask the children to explore a range of electrical systems that could be used to control their products, including a simple series circuit where a single output device is controlled, a series circuit where two output devices are controlled by one switch and, where appropriate, parallel circuits where two output devices are controlled independently by two separate switches. • Drawing on related computing activities, ensure that children can write computer control programs that include inputs, outputs and decision making. Test out the programs using electrical components connected to interface boxes or standalone boxes. • Teach children how to avoid making short circuits.	Develop an authentic and meaningful design brief with the children. • Ask the children generate innovative ideas by drawing on research and develop a design specification for their product, carefully considering the purpose and needs of the intended user. • Communicate ideas through annotated sketches, pictorial representations of electrical circuits or circuit diagrams. Drawings should indicate the design decisions made, including the location of the electrical components and how they work as a system with an input, process and output. • Produce detailed step-by-step plans and lists of tools, equipment and materials needed. If appropriate, allocate tasks within a team.	Make high quality products, applying knowledge, understanding and skills from IEAs and FTs. Create and modify a computer control program to enable the product to work automatically in response to changes in the environment. Make	Make	Critically evaluate throughout and the final product, comparing it to the original design specification. Test the system to demonstrate its effectiveness for the intended user and purpose.

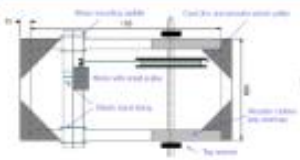
Resources
zinc carbon or zinc chloride batteries, crocodile leads, bulbs, bulb holders, buzzers, light emitting diodes (LEDs), micro switches, reed switches and magnets, light dependent resistors (LDRs), wire, automatic wire strippers, masking tape, construction materials and tools as required, computer control software and interface boxes or standalone boxes, connecting leads
Vocabulary
series circuit, parallel circuit, names of switches and components, input device, output device, system, monitor, control, program, flowchart function, innovative, design specification, design brief, user, purpose

Years 5/6

Electrical Systems

More complex switches and circuits

Instant CPD



Tips for teachers

- ✓ To ensure progression from Y3/4, children need to develop an understanding of 'monitoring' as well as control and the idea of 'input' as well as 'output'.
- ✓ This project should be undertaken soon after electricity is covered in science and programming, monitoring and control are undertaken in computing.
- ✓ Create a selection of images of existing products e.g. burglar alarm and outdoor security lighting, that use monitoring and control.
- ✓ Discuss the difference between products that rely upon timed events, such as traffic lights, and those that depend upon monitoring to make something happen such as a security alarm.
- ✓ Some children will be ready to use parallel circuits in their electrical systems and this enables two or more sensors or switches to be incorporated in their products.
- ✓ Have a 'working' circuit set up so that children can test suspect components.
- ✓ Some components e.g. buzzers and light emitting diodes (LEDs) need to be connected the right way round in a circuit, ensuring positive and negative match the poles of the battery.
- ✓ Make sure electrical components and batteries match e.g. 1.5v bulb with a 1.5v battery.
- ✓ Do not use rechargeable batteries.
- ✓ CLEAPS recommend zinc carbon and zinc chloride batteries for Primary schools, not rechargeable, lithium of alkaline as these can overheat if short circuited. Button batteries are not recommended for younger children.
- ✓ Use non-mercury tilt switches.

Useful resources at www.data.org.uk

- Torches, Lamps and Lanterns
- Alarming Vehicles
- Designing and making alarm circuits using inputs with computer control

Switches and sensors

Latching switch

Micro-switch

Light-dependent resistor (LDR)

Push-to-make switch
When you push, the electricity flows through the circuit, but when you release it the circuit is broken and the switch is off.

Push-to-break switch
The switch is off while the button is pushed, but returns to its 'on' position when button is released.

Reed switch
Activated by a magnet which closes the contacts.

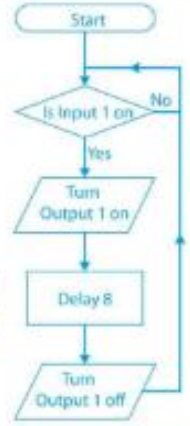
Tilt switch
When tilted a ball bearing bridges the contacts inside, completing the circuit.

- Micro-switch – a switch that can operate as push-to-break switch or a push-to-make switch.
- Push-to-break switch – a switch turned off by pressing it.
- Push-to-make switch – a switch turned on by pressing it.
- Reed switch – a switch operated by a magnet.
- Tilt switch – a switch that works when tilted at an angle.
- Toggle switch – a switch operated when a lever is pressed.
- Light dependent resistor (LDR) – a sensor that operates when light is shined on it.

Standalone control box

Interface control box

Example control program



- Children need to learn how to write a sequence of instructions where a decision is made e.g. when a switch is pressed a buzzer is activated.
- They use a 'control language' or create a flowchart to produce a series of instructions.
- Children's computing knowledge and skills need to focus on using input and output devices connected to a standalone box or interface box.
- They use their learning in computing to control and monitor products they have designed and made e.g. alarm system.

Designing, making and evaluating an alarm to protect a valuable artefact

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:

THOUGHT	ACTION
What will my alarm be for? What will it protect? Who will control it? What components will it need?	Developing innovative ideas through discussion and annotated sketches, generating a design specification.
Which switches or sensors should I use? What output devices should I use?	Discussing ideas, modelling possible electrical circuits. Recording design ideas pictorially or using circuit diagrams.
What tools and components will I need? What sequence of steps will I use?	Developing a step-by-step plan.
How can computer control improve my alarm system?	Writing and testing programs and connecting to a control box.
More thoughts... appraising, reflecting, refining.	More actions... assembling, testing, modifying.
Will the alarm achieve its purpose?	Evaluating the alarm against the original design specification.

Glossary

- **Modelling** – to realise and manipulate ideas in a tangible form.
- **Open switch** – when a switch is positioned such that electricity cannot flow through it.
- **Closed switch** – when a switch is positioned such that electricity can flow through it.
- **Normally open** – the term used to describe when a switch is in the off position, i.e. the switch is open and no electricity can flow when the button on not pressed.
- **Normally closed** – the term used to describe when a switch is in the on position i.e. the switch is closed and electricity can flow when the button is not pressed
- **Computer control input** – when a switch, such as a micro switch, sends a signal to a computer control box to activate a sequence of events such as a buzzer or light being used to attract attention or alert people.
- **Output devices** – components that produce an outcome e.g. bulbs and buzzers.
- **Input devices** – components that are used to control an electrical circuit e.g. switches or sensors.