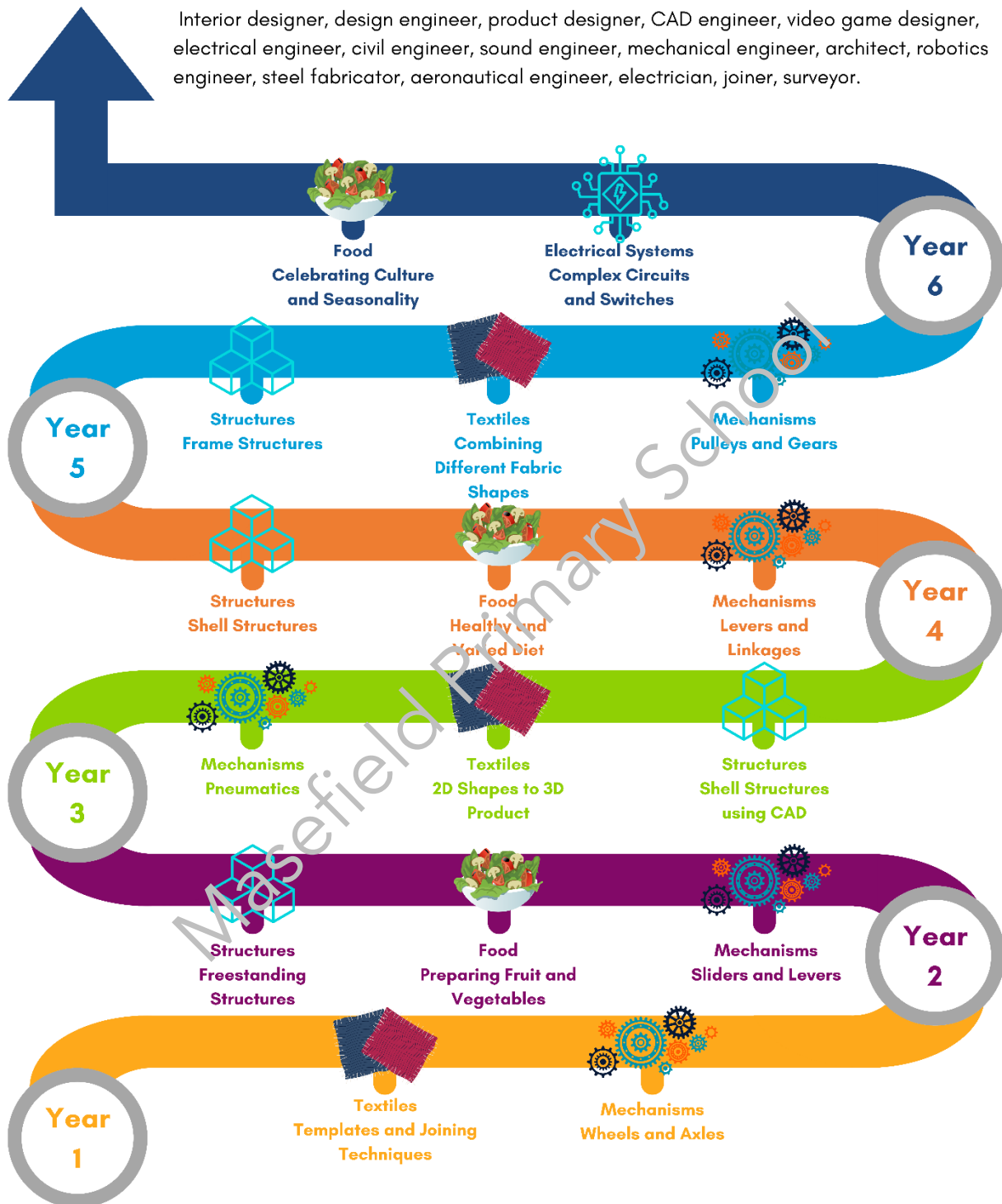# Design Technology

Curriculum Overview

Masefield Primary School

Design Technology

Design Technology Careers

Interior designer, design engineer, product designer, CAD engineer, video game designer, electrical engineer, civil engineer, sound engineer, mechanical engineer, architect, robotics engineer, steel fabricator, aeronautical engineer, electrician, joiner, surveyor.

Food
Celebrating Culture and Seasonality

Electrical Systems
Complex Circuits and Switches

Year 6

Year 5

Structures
Frame Structures

Textiles
Combining Different Fabric Shapes

Mechanisms
Pulleys and Gears

Structures
Shell Structures

Food
Healthy and Varied Diet

Mechanisms
Levers and Linkages

Year 4

Year 3

Mechanisms
Pneumatics

Textiles
2D Shapes to 3D Product

Structures
Shell Structures using CAD

Structures
Freestanding Structures

Food
Preparing Fruit and Vegetables

Mechanisms
Sliders and Levers

Year 2

Year 1

Textiles
Templates and Joining Techniques

Mechanisms
Wheels and Axles

"Strive for perfection in everything you do. Take the best that exists and make it better. When it does not exist, design it."

– Sir Henry Royce

Lesson Sequence:

1	• Knowledge Organiser and vocabulary
2	• Research the Engineer
3/4	• Design the Product
5	• Make the Product
6	• Evaluate the Product

Design technology is an inspiring, rigorous and practical subject. Using creativity and imagination, pupils design and make products that solve real and relevant problems within a variety of contexts, considering their own and others' needs, wants and values. They acquire a broad range of subject knowledge and draw on disciplines such as mathematics, science, engineering, computing and art. Pupils learn how to take risks, becoming resourceful, innovative, enterprising and capable citizens. Through the evaluation of past and present design and technology, they develop a critical understanding of its impact on daily life and the wider world. High-quality design and technology education makes an essential contribution to the creativity, culture, wealth and well-being of the nation.

Aims

The national curriculum for design and technology aims to ensure that all pupils:

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

Attainment targets

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study. Schools are not required by law to teach the example content in [square brackets].

Subject content

Key stage 1

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home and school, gardens and playgrounds, the local community, industry and the wider environment].

When designing and making, pupils should be taught to:

Design

- design purposeful, functional, appealing products for themselves and other users based on design criteria
- generate, develop, model and communicate their ideas through talking, drawing, templates, mock-ups and, where appropriate, information and communication technology

Make

- select from and use a range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing]
- select from and use a wide range of materials and components, including construction materials, textiles and ingredients, according to their characteristics

Evaluate

- explore and evaluate a range of existing products
- evaluate their ideas and products against design criteria

Technical knowledge

- build structures, exploring how they can be made stronger, stiffer and more stable
- explore and use mechanisms [for example, levers, sliders, wheels and axles], in their products.

Key stage 2

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home, school, leisure, culture, enterprise, industry and the wider environment]. When designing and making, pupils should be taught to:

Design

- use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups
- generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design

Make

- select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately
- select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities

Evaluate

- investigate and analyse a range of existing products
- evaluate their ideas and products against their own design criteria and consider the views of others to improve their work
- understand how key events and individuals in design and technology have helped shape the world

- apply their understanding of how to strengthen, stiffen and reinforce more complex structures
- understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]
- understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors]
- apply their understanding of computing to program, monitor and control their products.

Statement of Intent for Design Technology

Design Technology embodies some of the highest forms of human creativity and technological advancement and we believe that it is our duty to develop cultural appreciation of designers, engineers, textile artists and chefs, and to develop knowledge of key individuals and their contributions in this field. It is through these key principles that we engage, inspire and challenge pupils whilst equipping them with knowledge and skills to explore, invent and create their own works of design and innovation.

At Masefield, Design Technology is taught as a discrete subject in order that the development of knowledge and skills is taught meaningfully and explicitly. Naturally, links are made to other areas of the curriculum but this does not dilute the quality and entitlement of high quality Design Technology teaching.

The school's long term plan for Design Technology sets out the content of teaching within in each year group. This is supported by the school's Design Technology progression document which demonstrates learning outcomes within each strand of development within a Design Technology unit. Short term planning details how this content is developed over a series of lessons within the unit of work. The organisation of the Design Technology curriculum provides structured opportunities for pupils to:

- record responses, including observations of the natural and made environment;
- gather resources and materials, using them to stimulate and develop ideas;
- explore and use two and three-dimensional media, working on a variety of scales;
- review and modify their work as it progresses;
- develop understanding of the work of designers, engineers, chefs, artists and craftspeople, from a range of times and cultures, applying knowledge to their own work;
- respond to and evaluate design and technology including their own and others' work;
- show development in their ability to create designs and products;
- understand and apply the basic principles of design and technology including: mechanisms, textiles, food, structures and electrical systems;
- realise their ideas and sustain a level of working from start to the completion of a project or a piece of work.

Knowing More and Remembering More in Design Technology

At Masefield, we recognise the importance of retrieval practice in making learning more efficient. Retrieval practice allows our teachers to identify and address gaps in knowledge and check for misunderstandings, whilst simultaneously allowing children to make and strengthen connections between their knowledge and providing firmer foundations for future learning. In Design Technology, all teachers follow these agreed procedures to support the consolidation of prior learning and the incremental development of new learning:

The beginning of every unit

In order to assess prior knowledge, the teacher will present the children with the previous years' LbQ question set for that topic where applicable.

This low stakes quiz allows children the opportunity to recall and strengthen relevant prior knowledge which then can be built upon over the upcoming lessons. This also allows teachers the opportunity to identify and address any gaps in prior knowledge or misconceptions so that they can accurately adapt their teaching to ensure that children build a strong knowledge of the required content.

The beginning of every lesson

At the beginning of every lesson, the teacher will refer back to the previous lessons within the sequence of learning. This provides children the opportunity to recall prior knowledge and make connections between this and the new learning in the current lesson.

The end of each unit

At the end of each unit, the teacher will present the children with the LbQ question set for that unit. This is a low stakes quiz which will assess the children's knowledge of the required content in each unit.

This allows children yet another opportunity to recall and strengthen their learning from this unit. It also provides teachers with a clear picture of children's understanding, which will inform their summative assessments for the unit. This allows the teacher another opportunity to address gaps in knowledge or misconceptions.

Friday Flashbacks

Through Friday Flashbacks, the teacher will present the children with the LbQ question sets for all the units taught so far that year. These are low stakes quizzes will assess the children's knowledge of the required content in each unit.

This allows children multiple further opportunities to recall and strengthen their learning from previous units. It also provides teachers with a clear picture of children's understanding and how their knowledge and skills are developing incrementally. It allows them multiple further opportunities to address gaps in knowledge or misconceptions.

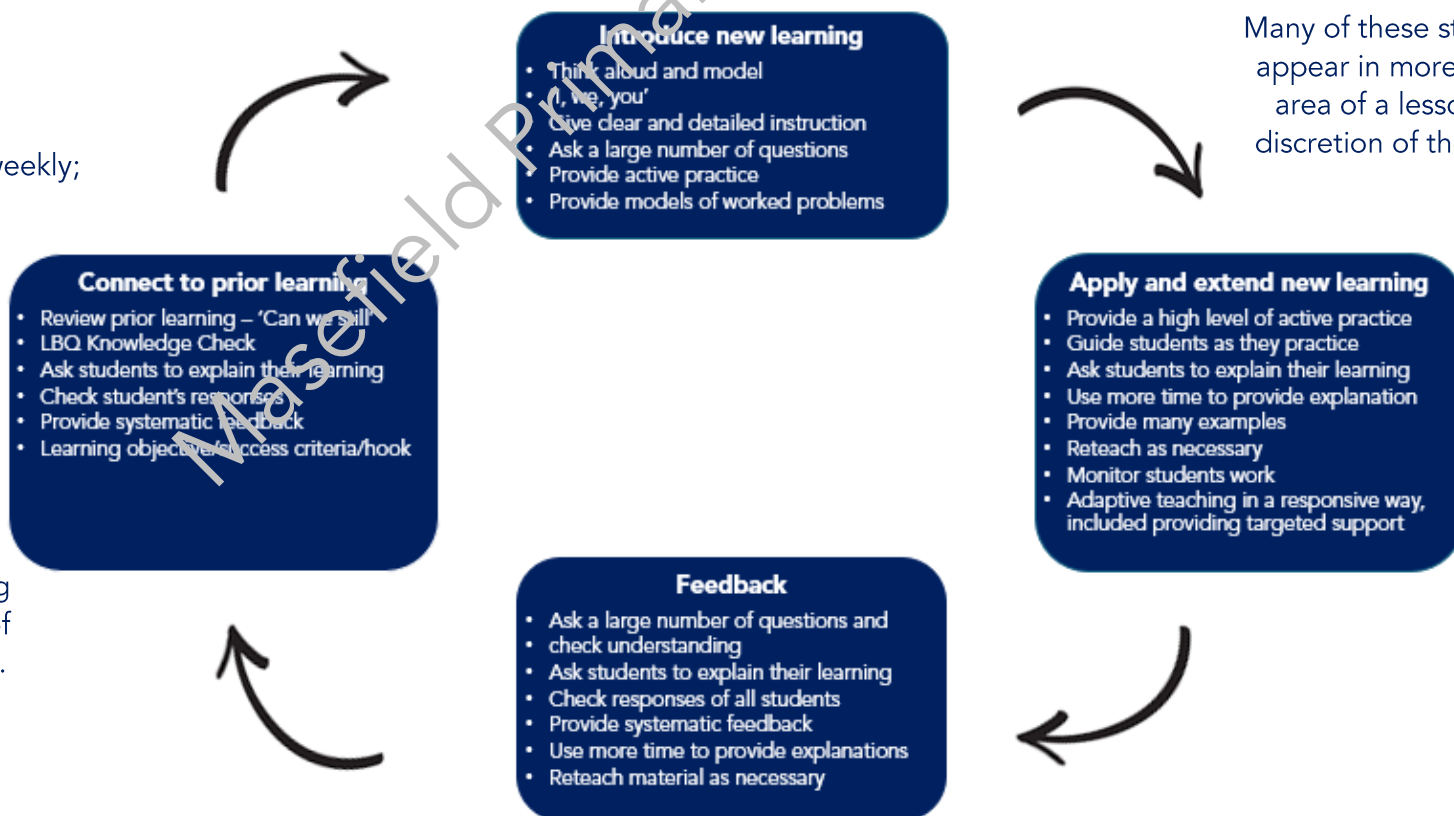# Teaching and Learning Delivery Model: Building Knowledge through Challenge

Teachers

- ✓ Have high expectations for all groups of children
- ✓ Have strong subject knowledge
- ✓ Promote independence
- ✓ Promote confidence
- ✓ Offer praise and encouragement
- ✓ Are enthusiastic and positive about learning
- ✓ Model good learning
- ✓ Offer high quality conversation and talk

Lessons

- ✓ Have a distinct knowledge base
- ✓ Are purposeful
- ✓ Are memorable
- ✓ Are active
- ✓ Are engaging
- ✓ Are focussed
- ✓ See children and teachers working as a learning team

Learning Opportunities

- ✓ Increase knowledge
- ✓ Develop basic skills
- ✓ Meet children's individual learning needs
- ✓ Broaden and extend experiences
- ✓ Offer an opportunity to try new things
- ✓ Are cross curricular if appropriate
- ✓ Offer first hand experiences through trips or visitors

There shall be no bad books!
- Vocabulary lesson;
- Regular foundation lessons – weekly;
- New page for each lesson;
- Marking grid for Seesaw work.

Many of these steps would appear in more than one area of a lesson at the discretion of the teacher.

Each lesson may not be a complete cycle of the learning sequence but over a period of time all areas will be covered.

Introduce new learning
- Think aloud and model
- 'I, we, you'
- Give clear and detailed instruction
- Ask a large number of questions
- Provide active practice
- Provide models of worked problems

Connect to prior learning
- Review prior learning – 'Can we still'
- LBQ Knowledge Check
- Ask students to explain their learning
- Check student's responses
- Provide systematic feedback
- Learning objective/success criteria/hook

Apply and extend new learning
- Provide a high level of active practice
- Guide students as they practice
- Ask students to explain their learning
- Use more time to provide explanation
- Provide many examples
- Reteach as necessary
- Monitor students work
- Adaptive teaching in a responsive way, included providing targeted support

Feedback
- Ask a large number of questions and
- check understanding
- Ask students to explain their learning
- Check responses of all students
- Provide systematic feedback
- Use more time to provide explanations
- Reteach material as necessary

Adaptive Teaching

"We are what we repeatedly do. Excellence, then, is not an act, but a habit."

What is Adaptive Teaching and why do we do it?

With adaptive teaching, all pupils are given one explicit instructional goal. They all access the same ambitious curriculum. The teacher teaches to the top and scaffolds pupils who need support to reach that level. When not needed, the teacher removes scaffolds or fades them out.

This approach promotes high achievement for all and doesn't cap opportunities or aspirations.

I do → We do → You do
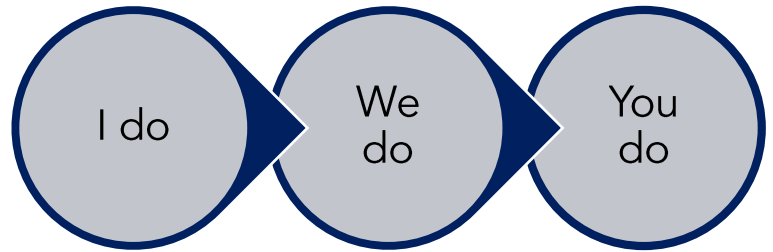
Explicit Instruction

Adaptive practice:
Pre-teach or TA support during modelling.

Shared Instruction

Check:
Use this section to check pupils' understanding. Can they do it with the structure in place?

Independent Practice

Reflect and Respond:
Allow students who have successfully completed the 'We Do' to move on independently. Group together those who are still struggling and complete work with adult support.

Before the lesson…

Lower ability pupils	Pupils with a low reading age	SEND pupils	EAL pupils
Do they need a pre-teach? Can they complete this when they arrive?	Do they need a keyword and definition list? Are they having 1:1 reading - could this be reading they will do as part of a foundation subject lesson or reading lesson?	What resources will they need to support them in successfully completing the task (task sheet, checklists, mind maps etc.)? Communicate with TA beforehand to co-ordinate effective support.	Do they need translated resources? Laptops?

During the lesson…

CHECK REFLECT RESPOND	ENOUGH CORRECT	Practise, consolidate, move on
	NOT ENOUGH CORRECT	Re-explain, more questioning, further chunking, modelling, further scaffolding, check your question then re-check for understanding.

Further support…	Refer to Adaptive Teaching booklet, mini-whiteboards, LBQ, targeted support, additional practice, modelling (I do, we do, you do), breakdown content (chunking).

- Adjust the level of challenge – e.g provide sentence stems and question prompts to support thinking, allow children to present their work in different ways (mind maps, collaborative work).
- Clarify/simplify a task or provide numbered steps with visual representations (objects, pictures, signs, photos).
- Use bold essential content from curriculum document.
- Re-explain a concept or explain it in a different way.
- Give additional (or revisit) examples.
- Use peer tutoring/collaborative learning (everyone must participate – give them roles).
- Provide additional scaffolds - e.g – pre-teach vocabulary, 'I do, we do, you', chunk learning into smaller chunks and break learning down into key knowledge, provide worked examples, provide sentence starters for writing, use media (photographs, film) and hands on resources, where possible.
- Set clear targets/expectations.
- Provide prompts/sentence stems – e.g provide/develop with children steps to success for children to work from, question prompts to support with thinking and reduce cognitive overload.
- Improve accessibility (e.g. proximity to speaker, visibility of whiteboard, read a text to the pupil) – e.g – child-friendly texts/media, where possible. When researching, use child appropriate websites.
- Consider pace - (extra time for responses to questions, contributing to class discussions and to complete activities).
- Provide vocabulary with visual images – e.g - explicitly teach vocabulary at the beginning of a unit alongside a picture of the key word, use photographs to represent the word when using it during the unit.
- Check understanding and reinforcing as needed through repetition, rephrasing, explaining and demonstration – e.g use of mini-plenaries to check understanding (quick quizzes).
- Have alternative ways to record learning, e.g. oral, photographic, video, highlighting text, mind maps, etc. – e.g give children a variety of ways to record their work (recording themselves, use of technology, mind maps), allow children to be creative in the ways that they present their work – they do not all have to be the same.
- Pre-teach vocabulary, key content etc.

- Identify and account for prior knowledge – a child who has extensive prior knowledge could be asked to present some of the knowledge they have to the class; explain something they understand easily to a child who doesn't 'get it' so quickly – e.g – peer modelling, a more able child could present interesting facts that they already know to the children, more able children given more challenging enquiry based questions to extend their learning.
- Build on interests to extend - read widely around a subject outside of lesson time by providing them with information about suitable material, e.g. give them suitable higher-level texts to read – e.g – Use of History Pupil Leaders to develop love of History, questions to research for home learning, projects to complete for home learning.
- Depth of content - consider what you can add to create depth, e.g. digging into an area more deeply, going laterally with a concept, or asking pupils to use more complex terminology to describe abstract ideas.
- Use questioning techniques to boost thinking – ask open-ended questions which require higher-order thinking - e.g – How........Why........What does this source tell us?
- Consider learner roles – ensure they are appropriately challenged through the role they are given so they can make an effective contribution; argue in favour of a viewpoint that is different to their own, e.g. argue the opposite position to that which they actually hold, during a class debate, take on a more supportive 'tutor' role during group work.
- Mastery - more intensive teaching, tutoring, peer-assisted learning, small group discussions, or additional homework. e.g - analyse and interpret sources (questions – what's this? What can we say for certain? What can we infer? Does this new source strengthen, amend or completely change our thinking? What doesn't the source tell us?
- Adapted success criteria/choice of task – offer a choice of tasks with a different level of challenge.
- Feedback – framing feedback so pupils must take responsibility for improving their own learning – e.g extend more able learners through open-ended questions when providing feedback.

Learning by Questions – Using EdTech to support Teaching and Learning

What is Learning by Questions?

Pupils' use iPads and progress at their own pace and level through high quality Question Sets and receive immediate automatic feedback as they answer. Teachers receive live analysis and results are saved to support assessment and planning. Data is stored automatically to support lesson planning.

Why do we use it?

Learning by Questions (LbQ) is fully embedded into Masefield's curriculum journey. This evidence based and award winning teaching & learning tool has been fundamental in the significantly above average results at Masefield over the last few years. All teachers and pupils have accounts that allow access to all resources.

What support do I get?

- Tracked classes set up in the first week of the academic year.
- Every member of staff (teachers and TAs) will receive regular CPD on LbQ, including meeting updates, 1:1 CPD, in class coaching and observations.
- Question Sets are ready made for all subjects, including every foundation subject unit from Year 1 to Year 6.

Using LbQ in Maths

- 3 tasks completed daily as morning maths - LBQ tasks that start with 'practise'. Basic skills and previous learning only.
- Used as a teaching and learning tool – not assessment.
- Intervention screen should be used regularly to assess pupils understanding and address misconceptions immediately.
- Green button (play) should be used regularly to involve and engage all learners in the lesson.
- Pupils should not get an incorrect answer more than 3 times. The teacher or TA should intervene before this or the pupil must ask for support.
- LbQ to be used as part of the deeper learning within lessons.
- An application of the learning within the lesson must be shown in maths book (usually reasoning and problem solving).

Using LbQ in Reading

- Used for intervention sessions.
- Used as part of reading in foundation subjects.
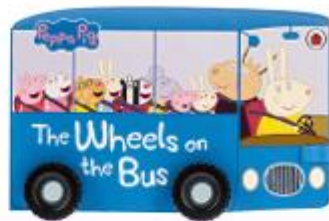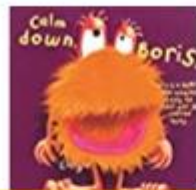
Using LbQ in Science

- Vocabulary question set to be completed before Science Unit.
- Previous topic (if appropriate) to be completed before Science Unit (e.g Year 4 Light question set to be completed before teaching of Year 6 Light topic).
- Investigation question set available to support teaching of fair testing.
- Knowledge Review question set to be used at end of topic – or once teaching sequence completed.
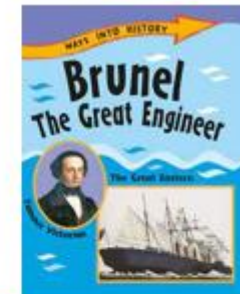
Using LbQ in Foundation Subjects

- Question Sets to be completed at the end of learning and during knowledge days.
- Refer to Knowledge Day Overview document for Question Set Record.

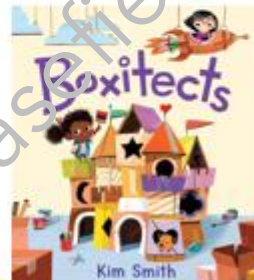# Design Technology Literature Spine

To support the teaching of Design Technology here at Masefield, we have developed a collection of books that all children in our school are to experience and enjoy. We aim to immerse our children in a range of texts, specifically chosen by our staff to ensure that children hear the best stories read aloud to them by their teachers for pleasure, to excite and inspire our children and support the development of knowledge and skills in Design Technology.
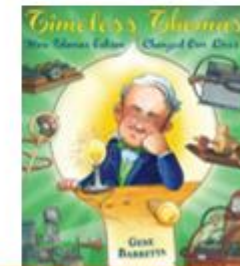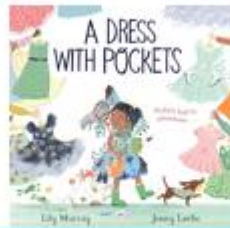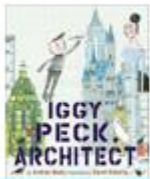
Year One
- Calm down, Boris
- The Wheels on the Bus

Year Two
- Peter Pan
- Summer Supper
- Brunel The Great Engineer

Year Three
- Look inside How Things Work
- Coco Chanel
- Boxitects (Kim Smith)

Year Four
- Alice's Adventures in Wonderland
- How Did That Get In My Lunchbox? The Story of Food
- Timeless Thomas

Year Five

Year Six

Masefield Primary School

Long-term Overview for Design Technology

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year One				Textiles Templates and Joining Techniques		Mechanisms Wheels and Axles
Year Two		Mechanisms Sliders and Levers		Food Preparing Fruit and Vegetables		Structures Freestanding Structures
Year Three		Mechanisms Pneumatics		Textiles 2D Shapes to 3D Product		Structures Shell Structures using CAD
Year Four		Mechanisms Levers and Linkages		Food Healthy and Varied Diet		Structures Shell Structures
Year Five		Structures Frame Structures		Textiles Combining Different Fabric Shapes		Mechanisms Pulleys and Gears
Year Six				Electrical Systems Complex Circuits and Switches		Food Celebrating Culture and Seasonality

Design Technology in the Early Years Foundation Stage

Design Technology is taught in EYFS as part of Expressive Arts & Design. Most learning will take place through continuous provision following teacher modelling.

Examples include:

· Construction Area e.g building chairs for Baby Bear following the story of Goldilocks, building houses for the three little pigs, building shelters for animals due to hibernate, building structures linked to countries/capital cities, building buildings from the local area

· Food – linked to festival and calendar events throughout the year – examples include chocolate sparklers, witches hats, jam sandwiches, fruit salad,

· Food Hygiene – children are taught to wash their hands before and after preparing food and why, children are taught to wash fruit and veg before it is cut/cooked, children are taught to clean the area being used for food preparation before and after use

· Structures – using tape and glue to build, building structures linked to countries/cities, using clay and playdough as a base for a lollipop stick/matchstick structure

· Junk Modelling – children have continuous access to junk modelling resources – paper, card, boxes, tubs, tubes, pipe cleaners, lollipop sticks, glue, sellotape, masking tape, scissors. Challenges are set for children to complete within this area of the classroom.

Three- and Four-Year-Olds

Physical Development
- Know the names of key tools and resources, e.g. glue and scissors, and what they are used for.
- Know the correct grip to use when holding scissors, pencils and other one-handed tools.

Expressive Arts and Design
- Have a knowledge of natural, made and imaginative environments and use this knowledge to inspire their own ideas, in small world play, such as a city with different buildings and a park.
- Know how to connect pieces together such as Lego or bricks.
- Know the names of some different materials, including food, and their basic properties, i.e. what they would be good for.
- Know what they want to and could make, and which materials would work well.
- Know what some different shapes look like and how to create them, in order to create drawings to record their design ideas.

Reception

Physical Development
- Know techniques to help them move carefully and with control.
- Know the names of a range of tools.
- Know how to hold and use a range of tools for a desired outcome, e.g. tape and glue used to build a structure.
- Know the safety rules when using certain tools, resources and equipment.

Expressive Arts and Design
- Know the names of different feelings.
- Know that art and design can inspire feelings and emotions, and vice versa.
- Know the names of a range of artistic effects, e.g. colouring, collage, etc. and what these look like. Know that these effects can be used to improve the appearance of something.
- Know that they can return to and build on their previous learning, and know who to ask for help when needed.
- Know that it is okay to make mistakes, and have some techniques for using these situations as opportunities to build their own resilience.
- Know techniques for working collaboratively with adults and other children, sharing ideas, resources and skills.

Early Learning Goal

Physical Development
- Know how to use a range of small tools, including scissors, paintbrushes and cutlery.

Expressive Arts and Design
- Know how to safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function.
- Know that they can share their creations, explaining the process they have used.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic				**Textiles** Templates and Joining Techniques		**Mechanisms** Wheels and Axles
LBQ Assessment				Y1 Textiles LBQ Question Set		Y1 Mechanisms LBQ Question Set
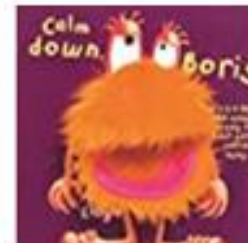
Year One

Textiles: Templates and Joining techniques

Engineer Focus:

James Fox

Vocabulary for this unit:

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.

National Curriculum objectives:

Design

- Design a functional and appealing product for a chosen user and purpose based on simple design criteria.
- Generate, develop, model and communicate their ideas as appropriate through talking, drawing, templates, mock-ups and information and communication technology.

Make

- Select from and use a range of tools and equipment to perform practical tasks such as marking out, cutting, joining and finishing.
- Select from and use textiles according to their characteristics.

Evaluate

- Explore and evaluate a range of existing products
- Evaluate their ideas and products against design criteria

Technical Knowledge

- Understand how simple 3-D textile products are made, using a template to create two identical shapes.
- Understand how to join fabrics using different techniques e.g. running stitch, glue, over stitch, stapling.
- Explore different finishing techniques e.g. using painting, fabric crayons, stitching, sequins, buttons and ribbons.
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit follows on from Reception where children had experiences of threading beads and laces. This unit is a pre-cursor of Textiles in Year 3 where children will practise cutting fabric, seam allowance and a range of stitches. Also, in Year 5, children will be creating a pencil case with a fastening and will learn more complex stitches.

Sequence of Learning

Step 1

Retrieval of previous learning
- Introduce and explore knowledge organiser.
- Teach new Vocabulary.
- Retrieval of previous learning

Step 2

Research the Engineer

Pupils should be taught that:
- James Fox works with machine embroidery.
- His works are shown in Manchester and Preston.
- His works look at modern life issues such as politics, gender, work and culture.

Step 3

Design the Product

Pupils should be taught to:
- Use different joining techniques to join fabrics together. Practise gluing, stapling and stitching fabric together using a running stitch. Children should discuss which they think would be the best joining technique to use when creating their puppet.
- Know what the terms join and fasten mean. What can we use to fasten materials together? Discuss the use of zips, buttons and Velcro and their purpose.
- Use a template to draw out and cut out a fabric shape.

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

o Design a functional and appealing hand puppet for a chosen user and purpose based on simple design criteria.

o Generate, develop, model and communicate their ideas as appropriate through talking, drawing, templates, and mock-ups.

Step 5

Make the Product

Pupils should be taught to:

o Thread a metal needle and to tie a knot.

o Complete a running stitch.

o Attach two pieces of material using a simple running stitch.

o Know how to finish a row of stitches with a knot.

Step 6

Evaluate the Product

Pupils should be taught to:

o Evaluate ongoing work and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

Step 7

Assessment

o End of Unit Outcome: To join two pieces of material together to create a hand puppet.

o LBQ Question Set.

Year Two Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic		**Mechanisms** Sliders and Levers		**Structures** Freestanding Structures		**Food** Preparing Fruit and Vegetables
LBQ Assessment		Y2 Mechanisms LBQ Question Set		Y2 Structures LBQ Question Set		Y2 Food LBQ Question Set
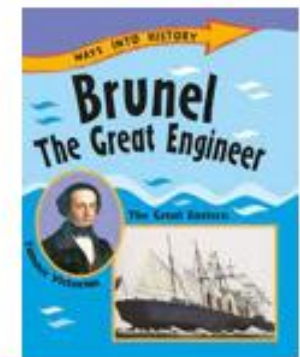
Year Two

Mechanisms: Sliders and Levers

Engineer Focus:

Robert Sabuda

Vocabulary for this unit:

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.
Pivot: a central point on which a mechanism turns.
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.

National Curriculum objectives:

Design
- Generate ideas based on simple design criteria and their own experiences, explaining what they could make.
- Develop, model and communicate their ideas through drawings and mock-ups with card and paper.

Make
- Select and use tools, explaining their choices, to cut, shape and join paper and card.
- Use simple finishing techniques suitable for the product they are creating.

Evaluate
- Explore a range of existing books and everyday products that use simple sliders and levers.
- Evaluate their product by discussing how well it works in relation to the purpose and the user and whether it meets design criteria.

Technical Knowledge
- Explore and use sliders and levers.
- Understand that different mechanisms produce different types of movement.
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit follows on from learning in Reception and Year 1 where children will have had experiences of working with paper and card to makes flaps. This unit is the precursor to work studied in Year 3 where children will develop their understanding of pneumatics. They will look closely at forces and look at how mechanical systems work.

Sequence of Learning

Step 1

Retrieval of previous learning
- o Introduce and explore knowledge organiser.
- o Teach new Vocabulary (inc LBQ vocabulary question set where appropriate).
- o Retrieval of previous learning

Step 2

Research the Engineer
Pupils should be taught that:
- o Robert Sabuda is an artist from Michigan.
- o He started his career as an illustrator before writing children's books.
- o In 1994, he published his first pop-up book "The Mummy's Tomb".
- o He is known worldwide for his pop-up paper engineering.
- o Many of his books are based on traditional stories.

Step 3

Design the Product
Pupils should be taught to:
- o Explore moving parts by looking at books or cards that make use of sliders and levers.
- o Practise making a mock-up of a simple slider they could use in their design.

Sequence of Learning

Step 4

Design the Product
Pupils should be taught to:
- Generate ideas for a Christmas card based on simple design criteria and their own experiences, explaining what they could make.
- Develop, model and communicate their ideas through drawings and mock-ups with card and paper.

Step 5

Make the Product
Pupils should be taught to:
- Recognise the tools they will need to create their product.
- Draw their Christmas design.
- Develop their knowledge and skills by replicating the slider and lever teaching.

Step 6

Evaluate the Product
Pupils should be taught to:
- Evaluate their product by discussing how well it works in relation to the purpose and the user and whether it meets design criteria.

Step 7

Assessment
- End of Unit Outcome: To make a moving Christmas card with sliders and levers.
- LBQ Question Set.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic		**Mechanisms** Pneumatics		**Textiles** 2D Shapes to 3D Product		**Structures** Shell Structures using CAD
LBQ Assessment		Y3 Mechanisms LBQ Question Set		Y3 Textiles LBQ Question Set		Y3 Structures LBQ Question Set

Year Three

Textiles: 2D Shapes to 3D Product

Engineer Focus:

Coco Chanel

Vocabulary for this unit:

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.

National Curriculum objectives:

Design
- Generate realistic ideas through discussion and design criteria for an appealing, functional product fit for purpose and specific user.
- Produce annotated sketches, final product sketches and pattern pieces.

Make
- Plan the main stages of making.
- Select and use a range of appropriate tools with some accuracy e.g. cutting, joining and finishing.

Evaluate
- Investigate a range of existing products.
- Test their product against the original design criteria and with the intended user.

Technical Knowledge
- Know how to strengthen, stiffen and reinforce existing fabrics.
- Understand how to securely join two pieces of fabric together
- Understand the need for patterns and seam allowance.
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit follows on from learning in Year 1 where children will have experience of completing a simple running stitch on binca and felt with pre-made holes. The children will have attempted to tie knots and thread large eye needles. They will have created a simple, flat 3D product without needing to think about seam allowance. This unit is the precursor of the textiles unit in Year 5 in which children will move onto more complex stitches and create a product with fastenings.

Sequence of Learning

Step 1

Retrieval of previous learning
- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate).
- Retrieval of previous learning

Step 2

Research the Engineer
Pupils should be taught that:
- Gabrielle Chanel (her real name) was born in 1883 in a poor family to a market trader.
- Coco Chanel started her fashion career by designing hats. With the help of one of her male admirers, she opened her first shop in Paris in 1913. As it became more popular, she started selling clothes as well.
- In 1921, she created her first perfume, Chanel No 5.
- Coco Chanel's revolutionary designs were elegant but also comfortable and practical, as they freed women from wearing corsets

Step 3

Design the Product
Pupils should be taught to:
- Explore and evaluate a variety of materials and types of stitches (running stitch, overhand or back stitch), deciding which will be the most appropriate to use when making the product and explaining why in relation to the design brief.

Sequence of Learning

Step 4

Design the Product
Pupils should be taught to:
- o Sketch and annotate possible ideas, choosing one as a final choice and explaining why.
- o Add labels to their chosen design, detailing the materials and stitches used
- o Plan the main stages of making, e.g. create a flowchart.

Step 5

Make the Product
Pupils should be taught to:
- o Produce a template of their final design.
- o Use this template to cut around the felt.
- o Understand seam allowance.
- o Glue any decorative patterns onto the front panel.
- o Know how to join 2D pieces of felt with a running stitch, overhand stitch or backstitch.
- o Strengthen and reinforce stitches.

Step 6

Evaluate the Product
Pupils should be taught to:
- o Evaluate the product against user, purpose and design criteria.
- o Evaluate the joining of the fabric.

Step 7

Assessment
- o End of Unit Outcome: To securely join two pieces of fabric together to create a bag.
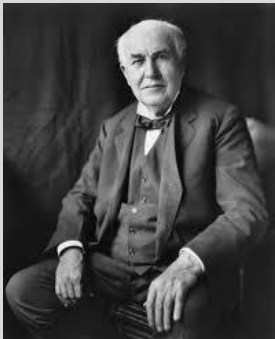- o LBQ Question Set

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic		**Mechanisms** Levers and Linkages		**Food** Healthy and Varied Diets		**Structures** Shell Structures
LBQ Assessment		Y4 Mechanisms LBQ Question Set		Y4 Food LBQ Question Set		Y4 Structures LBQ Question Set
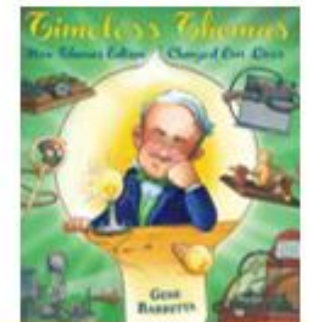
Year Four

Structures: Shell Structures

Engineer Focus:

Thomas Edison

Vocabulary for this unit:

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.

National Curriculum objectives:

Design
- Generate realistic ideas and design criteria collaboratively through discussion, focusing on the needs of the user and purpose of the product.
- Develop ideas through the analysis of existing products and use annotated sketches and prototypes to model and communicate ideas.

Make
- Order the main stages of making.
- Select and use appropriate tools to measure, mark out, cut, score, shape and assemble with some accuracy.
- Explain their choice of materials according to functional properties and aesthetic qualities.
- Use finishing techniques suitable for the product they are creating.

Evaluate
- Investigate and evaluate a range of existing shell structures including the materials, components and techniques that have been used.
- Test and evaluate their own products against design criteria and the intended user and purpose.

Technical Knowledge
- Develop and use knowledge of how to construct strong, stiff shell structures.
- Develop and use knowledge of nets of cubes and cuboids and, where appropriate, more complex 3D shapes.
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit follows on from learning in Year 2 and Year 3 where children have experienced how to construct and strengthen a freestanding structure, assembling 3D nets and using computer aided design in order to create 3D products. This unit is a precursor to the Year 5 structures unit in which children will assemble a frame structure using wood and will look at triangulation.

Sequence of Learning

Step 1

Retrieval of previous learning
- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate).
- Retrieval of previous learning

Step 2

Research the Engineer
Pupils should be taught that:
- Thomas Edison was born on 11th February 1847 in America.
- He is known for creating the first working lightbulb.
- He created The Phonograph – the first machine that was able to record and playback sound

Step 3

Design the Product
Pupils should be taught to:
- 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?*

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

- o 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?*
- o Practise making nets out of card, joining flat faces with masking tape to create 3-D shapes.

Step 5

Make the Product

Pupils should be taught to:

- o Use kit parts with flat faces to construct nets.
- o Apply the skills and techniques of scoring, cutting out and assembling pre-drawn nets in order to construct a simple box. Show how a window could be cut out and acetate sheet added.
- o Use different ways of stiffening and strengthening their shell structures e.g. folding and shaping, corrugating, ribbing, laminating.
- o Discuss and explore the graphics techniques and media that could be used to achieve the desired appearance of their products.

Step 6

Evaluate the Product

Pupils should be taught to:

- o To evaluate throughout and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

Step 7

Assessment

- o End of Unit Outcome: To create a 2D net and construct a 3D box.
- o LBQ Question Set

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic		**Structures** Frame Structures		**Textiles** Combining Different Fabric Shapes		**Mechanisms** Pulleys and Gears
LBQ Assessment		Y5 Structures LBQ Question Set		Y5 Textiles LBQ Question Set		Y5 Mechanisms LBQ Question Set

Masefield Primary School

Year Five

Textiles: Combining Different Fabric Shapes

Engineer Focus:

Faith Ringgold

Vocabulary for this unit:

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.

National Curriculum objectives:

Design
- Generate innovative ideas by carrying out research of existing products.
- Develop, model and communicate ideas through drawings, templates, mock-ups and prototypes.
- Design purposeful, functional and appealing products for the intended user that are fit for purpose.

Make
- Produce detailed lists of equipment and fabrics relevant to their tasks.
- Formulate step-by-step plans.
- Make products that are accurately assembled and well finished.

Evaluate
- Investigate and analyse textile products linked to their final product.
- Compare the final product to the original design specification.
- Test products with intended user and critically evaluate the quality of the design, manufacture, functionality and fitness for purpose.

Technical Knowledge
- A 3D textile product can be made from a combination of accurately made pattern pieces, fabric shapes and different fabrics.

Context for Study:

This unit follows on from learning in Year 1 and Year 3 where children will have experienced completing some basic stitching techniques. They will have threaded a needle, secured thread with a knot and fastened a row of stitches with a knot. They will have cut fabric, used templates and joined two pieces of fabric together using thread.

Sequence of Learning

Step 1

Retrieval of previous learning
- o Introduce and explore knowledge organiser.
- o Teach new Vocabulary (inc LBQ vocabulary question set where appropriate).
- o Retrieval of previous learning

Step 2

Research the Engineer

Pupils should be taught that:
- o She was born on 8th October 1930 in New York.
- o The works that Ringgold created in 1960s were inspired from the Impressionism, Africa art and Cubism.
- o The American People Series was created in 1963. It was the first political collection of Ringgold. The works highlighted the point of view of women toward the racial interaction.
- o She has also written and illustrated 11 children's books.
- o Faith Ringgold has said that she uses her work to tell a story.

Step 3

Design the Product

Pupils should be taught to:
- o Know the intended user and purpose.
- o Know how to create a simple design brief, e.g. *user: myself; purpose: to create a storage pouch e.g. pencil case to keep smaller items safe; criteria: must include two pieces of fabric sewn together and a secure fastening. It must be easy to sew by hand and be made from given materials.*

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

o   Sketch and annotate possible ideas, choosing one as a final choice and explaining why.
o   Add labels to their chosen design e.g. seam allowance, front, back, pattern symbols.

Step 5

Make the Product

Pupils should be taught to:

o   Mark out the measurements on tracing paper.
o   Use this template to cut around the fabric.
o   Understand seam allowance.
o   Know how to finish a row of stitches with a knot.
o   Know a range of stitches including the overhand stitch.
o   Practise sewing a press stud button on felt.
o   Know how to sew two 2D pieces of fabric together.
o   Glue any decorative patterns onto the front panel, allowing for the seam.

Step 6

Evaluate the Product

Pupils should be taught to:

o   Evaluate the product against user, purpose and design criteria and the joining of the fabric.
o   Discuss possible improvements.

Step 7

Assessment

o   End of Unit Outcome: To make a pencil case that can be constructed by hand and using simple materials.
o   LBQ Question Set.

Year Six Overview

Topic	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic				**Electrical Systems** Complex Circuits and Switches		**Food** Celebrating Culture and Seasonality
LBQ Assessment				Y6 Electrical Systems LBQ Question Set		Y6 Food LBQ Question Set
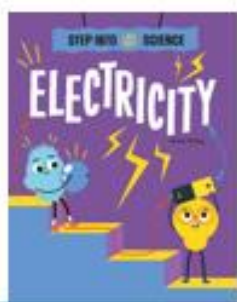
Year Six

Electrical Systems: Complex Circuits and Switches

Engineer Focus:

Sir Jony Ive

Vocabulary for this unit:

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

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.

National Curriculum objectives:

Design

- Use research to develop a design specification for a functional product that responds automatically to changes in the environment. Take account of constraints including time, resources and cost.
- Generate and develop innovative ideas and share and clarify these through discussion.
- Communicate ideas through annotated sketches, pictorial representations of electrical circuits or circuit diagrams.

Make

- Formulate a step-by-step plan to guide making, listing tools, equipment, materials and components.
- Competently select and accurately assemble materials, and securely connect electrical components to produce a reliable, functional product.
- Create and modify a computer control program to enable an electrical product to work automatically in response to changes in the environment.

Evaluate

- Continually evaluate and modify the working features of the product to match the initial design specification.
- Test the system to demonstrate its effectiveness for the intended user and purpose.
- Investigate famous inventors who developed ground-breaking electrical systems and components.

Technical Knowledge

- Understand and use electrical systems in their products.
- Apply their understanding of computing to program, monitor and control their products.
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit is supported by an external ICT company to deliver the unit due to the technical element of equipment needed.

Sequence of Learning

Step 1

Retrieval of previous learning
- o Introduce and explore knowledge organiser.
- o Teach new Vocabulary (inc LBQ vocabulary question set where appropriate).
- o Retrieval of previous learning

Step 2

Research the Engineer

Pupils should be taught that:
- o Sir Jonathan Paul Ive, is a British industrial designer and Apple executive who was responsible for making design as integral to the appeal of a personal computer as its power and speed.
- o He is responsible for the design of many Apple products we use today such as the iMac, iPhone, iPad and iWatch.

Step 3

Design the Product

Pupils should be taught to:
- o Conduct consumer research, looking at products which use electrical systems to detect changes in the environment, such as Alexa/Ring Doorbells.
- o Understand the input/output process of an electrical system through the use of Microbits and Strawbees.

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

o Develop a design specification for a functional robot that responds automatically to changes in the environment.
o Generate, develop and communicate ideas through discussion, annotated sketches and pictorial representations of electrical circuits or circuit diagrams.

Step 5

Make the Product (Bolton SICT)

Pupils should be taught to:

o Practise methods for making secure electrical connections e.g. using automatic wire strippers, twist and tape electrical connections, screw connections and connecting blocks.
o Make high quality products, applying knowledge, understanding and skills from investigative and evaluative activities and focused tasks.
o Create and modify a computer control program to enable the product to work automatically in response to changes in the environment.

Step 6

Evaluate the Product

Pupils should be taught to:

o Evaluate their work and their completed product, drawing on their design specification, and thinking about the intended purpose and user.

Step 7

Assessment

o End of Unit Outcome: To make a moving robot.
o LBQ Question Set