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.

"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

Design Technology Journey at Masefield

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 National Curriculum in England

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

Technical knowledge

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

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

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

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

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.

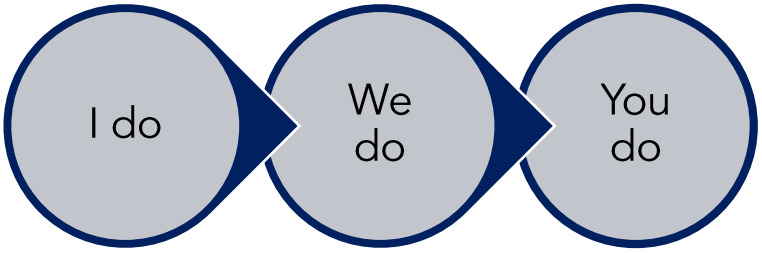
Adaptive Teaching

"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.



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).	

SEND – Adaptive Teaching Strategies to support and scaffold

- 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.

More Able – Adaptive Teaching Strategies to stretch and challenge

- 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

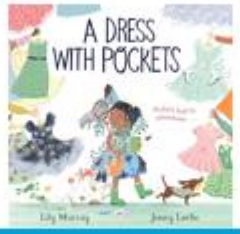
To support the teaching of Design Technology here at Masefield, we have developed a collection of books that all children in our school are to experience and enjoy. We aim to immerse our children in a range of texts, specifically chosen by our staff to ensure that children hear the best stories read 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

Year Two

Year Three

Year Four



Year Five

Year Six

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

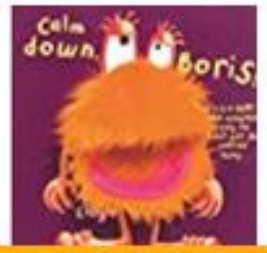
- Know how to use a range of small tools, including scissors, paintbrushes and cutlery.

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.

Year One Overview

	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

Year One – Spring 2

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:

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

- Thread a metal needle and to tie a knot.
- Complete a running stitch.
- Attach two pieces of material using a simple running stitch.
- Know how to finish a row of stitches with a knot.

Step 6

Evaluate the Product

Pupils should be taught to:

- 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

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

Year Two – Summer 2

Food: Preparing Fruit and Vegetables

Engineer Focus:

Jamie Oliver

Vocabulary for this unit:

Fruit: plant or tree 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.

National Curriculum objectives:

<u>Design</u>

- Design appealing products for a particular user based on simple design criteria.
- Generate initial ideas and design criteria through investigating a variety of fruit and vegetables.
- Communicate these ideas through talk and drawings.

<u>Make</u>

- Use simple utensils and equipment to e.g. peel, cut, slice, squeeze, grate and chop safely.
- Select from a range of fruit and vegetables according to their characteristics e.g. colour, texture and taste to create a chosen product.

<u>Evaluate</u>

- Taste and evaluate a range of fruit and vegetables to determine the intended user's preferences.
- Evaluate ideas and finished products against design criteria, including intended user and purpose.

<u>Technical Knowledge</u>

- Understand where a range of fruit and vegetables come from e.g. farmed or grown at home.
- Understand and use basic principles of a healthy and varied diet to prepare dishes, including how fruit and vegetables are part of the Eatwell Plate.
- Know and use technical and sensory vocabulary relevant to the project.

Context for Study:

This unit follows on from learning in Reception where children will have experience of naming common fruit and vegetables. They will have undertaken sensory activities to discuss the appearance, taste and smell of fruit and vegetables. This unit is a precursor to work studied in Year 4 where children will develop their understanding of preparing food hygienically and use a wider range of utensils. In Year 6, children will use a heated appliance (an oven) and develop their knowledge of food groups further.

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:

- Jamie Oliver MBE (James Trevor Oliver) was born 27th May 1975.
- He is an English celebrity chef, restaurateur, and media personality.
- He is known for his television shows, cookbooks and restaurants.
- He has highlighted the need for improved cooking in schools and hospitals.

Step 3

Design the Product

Pupils should be taught to:

- Generate initial ideas and design criteria through investigating a variety of fruit and vegetables.
- Know where certain fruits and vegetables are grown e.g. oranges/apples/bananas grow on trees; blueberries grow on shrubs; carrots/onions/beetroots grow underground; lettuces/broccoli grow above ground.
- Know the parts of different fruits and the parts we eat. E.g Skin/Seeds/stalk
- Know that we must have a balanced diet and that fruit and vegetables are part of a food group.
- Know that as part of a healthy diet, we need 5 portions of fruit and vegetables a day.

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

- Design appealing products for a particular user based on simple design criteria.
- Decide what to include in the fruit salad.
- Communicate these ideas through talk and drawings.

Step 5

Make the Product

Pupils should be taught to:

- Know basic food hygiene practices when handling food.
- Select from a range of fruit according to their characteristics e.g. colour, texture and taste to create a chosen product.
- Use simple utensils and equipment to e.g. peel, cut, slice, squeeze, grate and chop safely.
- Know how to prepare a fruit salad.

Step 6

Evaluate the Product

Pupils should be taught to:

- Evaluate ideas and finished products against design criteria, including intended user and purpose.

Step 7

Assessment

- End of Unit Outcome: To make a fruit salad.
- LBQ Question Set.

Year Three Overview

	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

Year Three – Autumn 2

Mechanisms: Pneumatics

Engineer Focus:

Richard Arkwright

Vocabulary for this unit:

Compressed: something that is squashed, such as air in a tube.
Input: what goes into a system.
Output: what comes out of a system.
Pivot: a point about which a lever turns.
Lever: a beam which turns about a point.
Pneumatic: a system that works using gases (air).
Hydraulic: a system that works using liquids (water).
Pressure: the force used on an object or surface.
Inflate: fill something with air or a gas to make it swell up.
Deflate: remove the pressurised air to allow an object like a balloon to shrink.
Syringe: a tube with a nozzle and plunger for sucking and blowing air or liquids.
System: a set of related parts or components used to create an outcome.

National Curriculum objectives:

Design

- Generate realistic and appropriate ideas and their own design criteria through discussion, focusing on the needs of the user.
- Use annotated sketches and prototypes to develop, model and communicate ideas.

Make

- Order the main stages of making.
- Select from and use appropriate tools with some accuracy to cut and join materials and components such as tubing, syringes and balloons.
- Select from and use finishing techniques suitable for the product they are creating.

Evaluate

- Investigate and analyse books, videos and products with pneumatic mechanisms.
- Evaluate their own products and ideas against criteria and user needs, as they design and make.

Technical Knowledge

- Technical knowledge and understanding
- Understand and use pneumatic mechanisms.
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit follows on from learning in Year 1 and Year 2 where children will have explored simple mechanisms, such as sliders and levers, and simple structures. Children will also have learnt how materials can be joined in order to allow movement. This unit is the precursor to work studied in Year 5 where children will make a 3D construction frame with 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:

- Richard Arkwright was born in Preston, England on 23 December 1732.
- In 1769 Richard Arkwright patented the spinning frame (later called the water frame), a machine to produce inexpensive spun cotton.
- In 1771, Arkwright and his business partners built the first water powered cotton mill at Cromford in Derbyshire.

Step 3

Design the Product

Pupils should be taught to:

- Know what a pneumatic system is.
- Explore existing products that use a pneumatic system to work, such as a tyre pump or a water gun. From this, explain how pneumatic systems work to perform a function.

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

- Generate realistic and appropriate ideas and their own design criteria for their moving toy through discussion, focusing on the needs of the user.
- Use annotated sketches and prototypes to develop, model and communicate ideas.

Step 5

Make the Product

Pupils should be taught to:

- Know the difference between an input and an output movement.
- Use two syringes that push air through a tube to operate the toy.
- Add levers and linkages to their design to make more complex mechanical systems

Step 6

Evaluate the Product

Pupils should be taught to:

- Evaluate the final products against the intended purpose and with the intended user, where safe and practical, drawing on the design criteria previously agreed.

Step 7

Assessment

- End of Unit Outcome: To make a moving toy.
- LBQ Question Set

Year Four Overview

	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

Year Four – Spring 2

Food: Healthy and Varied Diets

Engineer Focus:

Heston Blumenthal

Vocabulary for this unit:

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.
Processed food: ingredients that have been changed in some way to enable them to be eaten or used in food preparation and cooking.

National Curriculum objectives:

<u>Design</u>

- Generate and clarify ideas through discussion with peers and adults to develop design criteria including appearance, taste, texture and aroma for an appealing product for a particular user and purpose.
- Use annotated sketches and appropriate information and communication technology, such as web-based recipes, to develop and communicate ideas.

<u>Make</u>

- Plan the main stages of a recipe, listing ingredients, utensils and equipment.
- Select and use appropriate utensils and equipment to prepare and combine ingredients.
- Select from a range of ingredients to make appropriate food products, thinking about sensory characteristics.

<u>Evaluate</u>

- Carry out sensory evaluations of a variety of ingredients and products. Record the evaluations using e.g. tables and simple graphs.
- Evaluate the ongoing work and the final product with reference to the design criteria and the views of others.

<u>Technical Knowledge</u>

- Know how to use appropriate equipment and utensils to prepare and combine food.
- Know about a range of fresh and processed ingredients appropriate for their product, and whether they are grown, reared or caught.
- Know and use relevant technical and sensory vocabulary appropriately.

Context for Study:

This unit follows on from learning in Reception and Year 2 where children have explored where a range of fruit and vegetables come from e.g. farmed or grown at home. Children will also have an understanding of the basic principles of a healthy and varied diet, including how fruit and vegetables are part of the Eatwell Plate. This unit is a precursor to work studied in Year 6 where children will further develop their understanding of food groups and will use a wider range of utensils, including a heated appliance (an oven).

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:

- Heston is an English celebrity chef well known for his innovative spins on classic British foods.
- His restaurant, The Fat Duck, received a rating of three Michelin stars and was voted the #1 restaurant in the world in 2005.
- He received no formal culinary training.

Step 3

Design the Product

Pupils should be taught to:

- Investigate a range of food products.
- Make links to the principles of a varied and healthy diet using the Eatwell Plate 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?*
- Gather information about existing products available relating to their product.
- 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?*

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

- Sketch and annotate possible ideas, choosing one as a final choice and explaining why.
- Add labels to their chosen design, detailing the ingredients used and design elements.
- Plan the main stages of making, e.g. create a flowchart.

Step 5

Make the Product

Pupils should be taught to:

- 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 and spreading.
- Practise food preparation and cooking techniques 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?*

Step 6

Evaluate the Product

Pupils should be taught to:

- To evaluate the final product against the intended purpose and user, reflecting on the design criteria previously agreed.
- To consider what others think of the product when considering how the work might be improved.

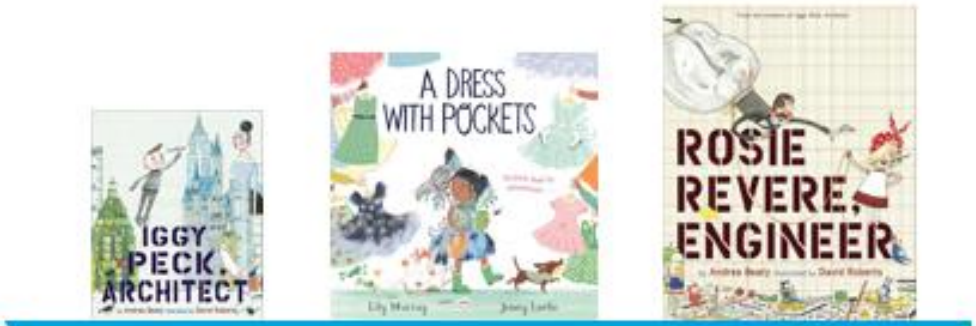
Step 7

Assessment

- End of Unit Outcome: To make a healthy sandwich or wrap.
- LBQ Question Set

Year Five Overview

	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



Year Five

Year Five – Autumn 2

Structures

Engineer Focus:

Peter Rice

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:

<u>Design</u>

- Carry out research into user needs and existing products, using surveys, interviews and questionnaires.
- Develop a simple design specification to guide the development of their ideas and products.
- Generate, develop and model innovative ideas through discussion, prototypes and annotated sketches.

<u>Make</u>

- Formulate a clear plan including a step-by-step list of what needs to be done and a list of resources needed.
- Select from and use appropriate tools to accurately measure, mark out, cut, shape and join materials to make frameworks.

<u>Evaluate</u>

- Investigate and evaluate a range of existing frame structures.
- 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.
- Research key events and individuals relevant to frame structures.

<u>Technical Knowledge</u>

- Understand how to strengthen, stiffen and reinforce 3D frameworks
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit follows on from learning in Year 3 and Year 4 where children will have experience of using measuring, marking out, cutting, joining, shaping and finishing techniques with construction materials. In addition, children will have a basic understanding of what structures are (freestanding, shell, frame) and how they can be made stronger, stiffer and more stable.

Year Five – Summer 2

Mechanisms: Pulleys and Gears

Engineer Focus:

Margaret E. Knight

Vocabulary for this unit:

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.

National Curriculum objectives:

Design

- Generate innovative ideas by carrying out research using surveys, interviews, questionnaires and web-based resources.
- Develop a simple design specification to guide their thinking.
- Develop and communicate ideas through discussion, annotated drawings, exploded drawings and drawings from different views.

Make

- Produce detailed lists of tools, equipment and materials. Formulate step-by-step plans and, if appropriate, allocate tasks within a team.
- Select from and use a range of tools and equipment to make products that that are accurately assembled and well finished. Work within the constraints of time, resources and cost.

Evaluate

- 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.
- Consider the views of others to improve their work.
- Investigate famous manufacturing and engineering companies relevant to the project.

Technical Knowledge

- Understand that mechanical and electrical systems have an input, process and an output.
- Understand how gears and pulleys can be used to speed up, slow down or change the direction of movement.
- Know and use technical vocabulary relevant to the project.

Context for Study:

This unit follows on from prior learning in Year 1 to Year 4 where children will have had experience of axles, axle holders and wheels that are fixed or free moving. Children will have a basic understanding of electrical circuits, simple switches and components and an understanding of how to strengthen and stiffen structures. In addition, children will have experience of cutting and joining techniques with a range of materials including card, plastic and wood.

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:

- When Margaret E. Knight was twelve, she saw an accident in a cloth factory. She invented a device that would automatically stop a machine if something were caught in it. The factories began using the device soon after.
- Later, Margaret worked in a paper bag factory. At that time, paper bags weren't flat on the bottom. Margaret thought about how much easier they'd be to use if they were flat and she went to work creating a machine that would make the bags.
- Margaret is most famous for her bag machine, but she went on to make 100 inventions and receive 20 patents.

Step 3

Design the Product

Pupils should be taught to:

- Develop an authentic and meaningful design brief.
- Generate innovative ideas by carrying out research through surveys, interviews and questionnaires and develop a design specification for their product, carefully considering the purpose and intended user for their product.

Sequence of Learning

Step 4

Design the Product

Pupils should be taught to:

- Communicate ideas through detailed, annotated drawings from different views and 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.

Step 5

Make the Product

Pupils should be taught to:

- Recap the difference between an input, process and output.
- Use a construction kit to explore combinations of two different size gears meshed together.
- To investigate the direction and speed of gear rotation, focusing on how the size of the driver gear affects the speed of the follower gear.
- To build a working circuit that incorporates a battery, a motor and a handmade switch.
- To use tools and equipment accurately including cutting and stripping wire, and making secure electrical connections.
- To 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.

Step 6

Evaluate the Product

Pupils should be taught to:

- Evaluate 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.

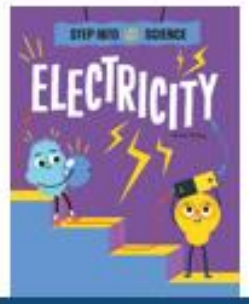
Step 7

Assessment

- End of Unit Outcome: To make a mechanical fairground ride.
- LBQ Question Set

Year Six Overview

	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

Year Six – Spring 2

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:

<u>Design</u>

- 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.

<u>Make</u>

- 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.

<u>Evaluate</u>

- 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.

<u>Technical Knowledge</u>

- 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

- 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:

- 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.
- 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:

- Conduct consumer research, looking at products which use electrical systems to detect changes in the environment, such as Alexa/Ring Doorbells.
- 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:

- Develop a design specification for a functional robot that responds automatically to changes in the environment.
- 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:

- Practise methods for making secure electrical connections e.g. using automatic wire strippers, twist and tape electrical connections, screw connections and connecting blocks.
- Make high quality products, applying knowledge, understanding and skills from investigative and evaluative activities and focused tasks.
- 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:

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

Step 7

Assessment

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