Developing an approach to teaching and learning in Design Technology

Design and 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 NC 2014

Expressive Arts and Design

Exploring and using media and materials: Children sing songs, make music and dance, and experiment with ways of changing them. They safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function. ELG 16

Being imaginative: Children use what they have learnt about media and materials in original ways, thinking about uses and purposes. They represent their own ideas, thoughts and feelings through design and technology, art, music, dance, role play and stories. ELG 17

"The nature of design and technology is such that it should provide opportunities for pupils to engage in activities that are challenging, relevant and motivating. This should give pupils enjoyment, satisfaction and a sense of purpose."

(DATA Primary Guidance, p4)

Teaching and learning in DT at Wormley Primary School aims to:

- develop the creative, technical and practical expertise of children needed to perform everyday tasks confidently and to participate successfully in an increasingly technological world
- support children to 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
- support children to critique, evaluate and test their ideas and products and the work of others help children understand and apply the principles of nutrition and learn how to cook
- develop a love of design

We encourage children to notice carefully and deeply, and demonstrate their learning in a variety of ways: designs, models, drawings, fact files etc. During their time at this school, they will make products and learn how to use a wide variety of tools, equipment, materials and components. Learning can be recorded in the children's artistic logs, class topic books, a class folder etc.

DEVELOPING SKILLS

There are key skills for pupils as designers:

Curiosity	Be curious about the world. Ask questions and wonder why
Active Listening	Give your full attention to what different people say, taking time to understand the points being made and asking questions as appropriate
Critical Thinking	Use logic and reasoning to identify the strengths and weaknesses of alternative ideas, conclusions or approaches to problems
Active Learning	Investigate ways to find out information from different sources to help with problem-solving and decision-making
Judgment and Decision Making	Have respect for alternative perspectives that may be different from our own. Take on advice from others
Collaboration	Work with others to learn from them and achieve more
Writing	Communicate effectively in writing for the needs of the audience.
Speaking	Talk clearly to others to convey information effectively.
Social Awareness	Recognise that people see things in different ways. Appreciate difference.
Persuasion	Persuade others to change their minds or behaviour based on your evidence

Through a variety of creative and practical activities, children 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.

MASTERY IN DT

We want children to achieve mastery of the DT curriculum by being able to plan, design and make an item, to fulfil a given criteria, in different contexts. This would require a good level of technical skill with a broad range of tools and use of innovative ways to enhance the outcome of an item. As our scheme of learning is a spiral curriculum, children revisit previous learning – skills and knowledge - and can improve over time.

OVERVIEW

CHEME OF LEARNING FOR DESIGN TECHNOLOGY

The progression of skills and techniques which link design technology to cross-curricular learning

			YEAR 1				
DESIGNER / INVENTOR DESIGNER		R / INVENTOR		DESIGNER / INVENTOR			
Jim Henson (creator of puppets for 5	esame Street and The Cha	arles Lé	on Stephen Sauvestre (architect of the	Eiffel	Jamie Oliver		
Muppets)		ver)					
The history of puppets (V&A Museu	im)	,					
PROJECT ON A PAGE	PRO	OJECT	ON A PAGE		PROJECT ON A PAGE		
Textiles	Stru	uctures			Food		
Templates and joining techniques	Free	e standi	ng structures		Preparing fruits and vegetables (including cooking and		
(A Hand Puppet)	(Bu	ild a to	wer to reach the top of the beanstalk)		nutrition requirements)		
					(fruit salad / fruit kebab	/ fruit smoothies)	
			YEAR 2				
DESIGNER / INVENTOR	DE	SIGNE	R / INVENTOR		DESIGNER / INVENT	TOR	
Russell Brown / Marcello Tully	Sir	Horace	Jones - Tower Bridge		Sir Alexander Arnold Constantine Issigonis - the mini		
PROJECT ON A PAGE	PR(OJECT	ON A PAGE		PROJECT ON A PAGE		
Food	Stru	uctures			Mechanisms		
Preparing fruit and vegetables. Invest		Investigating freestanding structures		Wheels and axles			
(Making bread / root vegetable loaf /	fruit loaf) Eg.	Eg. a bridge for a knight to cross the moat on his horse?		horse?	(push/pull toy, vehicle)		
			Progression Framework for KS1				
DESIGNING	MAKING		EVALUATING	TECHNIC	AL KNOWLEDGE	COOKING AND NUTRITION	
Understanding contexts, users	Planning		Own ideas and products	Making products work		Where food comes from	
and purposes	Across KS1 pupils should:		Across KS1 pupils should:	Across KS1 pupils should know:		Across KS1 pupils should know:	
Across KS1 pupils should:	 plan by suggesting what to of 	do	 talk about their design ideas and 	· about the simple working		· that all food comes from plants or	
·work confidently within a range of	next		what they are making	characteristics of materials and		animals	
contexts, such as imaginary,	 select from a range of tools 		 make simple judgements about 	components		· that food has to be farmed, grown	
story-based, home, school, gardens,			their products and ideas against	· about the movement of simple		elsewhere (e.g. home) or caught	
playgrounds, local community,	 select from a range of mater 		design criteria	mechanisms such as levers, sliders,		Food preparation, cooking and	
industry and the wider environment	t and components according to their		 suggest how their products could 	wheels and axles		nutrition	
· state what products they are					standing structures can	Across KS1 pupils should know:	
designing and making					ronger, stiffer and more	 how to name and sort foods into 	
· say whether their products are for			Across KS1 pupils should explore: stable			the five groups in the Eatwell	
themselves or other users	· follow procedures for safety and		 what products are 		textiles product can be	Guide	
 describe what their products are 			 who products are for 		from two identical	 that everyone should eat at least 	
for	 use a range of materials and 		 what products are for 	fabric shap	es	five portions of fruit and vegetables	
 say how their products will work 	components, including construction		how products work			every day	
	materials and kits, textiles, fo	ood	 how products are used 			<u> </u>	

products suitable for their intended	components	 what materials products are made 	combined according to their	safely and hygienically, without
users	· measure, mark out, cut and shape	from	sensory characteristics	using a heat source
· use simple design criteria to help	materials and components	· what they like and dislike about	· the correct technical vocabulary	· how to use techniques such as
develop their ideas	· assemble, join and combine	products	for the projects they are	cutting, peeling and grating
Generating, developing,	materials and components		undertaking	
modelling and communicating	· use finishing techniques,			
ideas	including those from art and design			
Across KS1 pupils should:				
· generate ideas by drawing on				
their own experiences				
· use knowledge of existing				
products to help come up with				
ideas				
 develop and communicate ideas 				
by talking and drawing				
 model ideas by exploring 				
materials, components and				
construction kits and by making				
templates and mock- ups				
 use information and 				
communication technology, where				
appropriate, to develop and				
communicate their ideas				

where products might be used
 that food ingredients should be
 how to prepare simple dishes

			YEAR 3			
		DESIGNER / INVENTOR Samuel Parkinson - designed the first modern day purse			DESIGNER / INVENTOR Robert Gair - invented the pre-cut cardboard box in 1890 –	
PROJECT ON A PAGE Food Health and varied diet (including cooking and nutrition		PROJECT ON A PAGE Textiles 2D and 3D product (pencil case /purse / fashion accessory)		flat pieces manufactured in bulk that folded into shape PROJECT ON A PAGE Structures Shell structures (including computer aided design) (gift box / desk tidy / party box)		
			YEAR 4			
DESIGNER / INVENTOR William Higinbotham created what is thought to be the first video game - Pong		DESIGNER / INVENTOR The Bedouins are thought to be the first people who made pitta bread			DESIGNER / INVENTOR Archimedes(c. 287-212 B.C.E.) - The lever was first described in 260 B.C.E. by Archimedes	
PROJECT ON A PAGE Electrical systems Simple circuits and systems (including programming and control) (nightlights)		PROJECT ON A PAGE Food Health and varied diet (including cooking and nutrition requirements) (wrap/pitta pocket / rice cakes) Progression Framework for LKS2		PROJECT ON A PAGE Mechanical systems Levers and linkages (story book/information book, moving story)		
DESIGNING Understanding contexts, users and purposes and purposes *work confidently within a range of contexts, such as the home, school, leisure, culture, enterprise, industry and the wider environment • describe the purpose of their	MAKING Plauning Aeross K52 papils should select tools and equipm suitable for the task explain their choice of equipment in relation to and techniques they will select materials and co	tools and the skills be using	EVALUATING Own ideas and products Acress K52 pupils should: - identify the strengths and areas for development in their ideas and products - consider the views of others, including intended users, to improve their work	Making pr Aeross K5. • how to us to help des that work • how to us mathematic make prod	CAL KNOWLEDGE coducts work J pupils should know: se learning from science ign and make products se learning from cs to help design and ucts that work	COOKING AND NUTRITION Where food comes from Aerosa K52 papils should know: * that a recipe can be adapted a by adding or substituting one or more ingredients * that food is grown (such as tomatoes, wheat and potatoes), reared (such as pigs, chickens and
products • indicate the design features of their products that will appeal to intended users • explain how particular parts of their products work In LKS2 pupils should also:	suitable for the task • explain their choice of and components according functional properties and qualities In LK52 pupils should at • order the main stages of Practical skills and tech Acress K52 pupils should Acress K52 pupils should	ing to d aesthetic lso: of making buiques	In LK52 popils should also: refer to their design criteria as they design and make use their design criteria to evaluate their completed products Existing products Across K52 popils should investigate and analyse:	functional qualities • that mate and mixed characteris • that mech	rials have both properties and aesthetic rials can be combined to create more useful tics sanical and electrical we an input, process and	cattle) and caught (such as fish) in the UK, Europe and the wider world Food preparation, nutrition and cooking Across K52 pupils should know: • how to prepare and cook a variety of predominantly savoury dishes safely and hygienically including.

· gather information about the	· follow procedures for safety and	· how well products have been	the correct technical vocabulary	where appropriate, the use of a heat
needs and wants of particular	hygiene	designed	for the projects they are	source
individuals and groups	· use a wider range of materials and	· how well products have been	undertaking	. how to use a range of techniques
· develop their own design criteria	components than KS1, including	made	In LKS2 pupils should also know:	such as peeling, chopping, slicing,
and use these to inform their ideas	construction materials and kits,	· why materials have been chosen	· how mechanical systems such as	grating, mixing, spreading,
Generating, developing,	textiles, food ingredients,	 what methods of construction 	levers and linkages or pneumatic	kneading and baking
modelling and communicating	mechanical components and	have been used	systems create movement	In LKS2 pupils should also know:
ideas	electrical components	 how well products work 	· how simple electrical circuits and	that a healthy diet is made up
Aeross KS2 pupils should:	In LKS2 pupils should also:	· how well products achieve their	components can be used to create	from a variety and balance of
 share and clarify ideas through 	· measure, mark out, cut and shape	purposes	functional products	different food and drink, as
discussion	materials and components with	 how well products meet user 	 how to program a computer to 	depicted in the Eatwell Guide
 model their ideas using 	some accuracy	needs and wants	control their products	. that to be active and healthy, food
prototypes and pattern pieces	 assemble, join and combine 	In LK52 pupils should also	 how to make strong, stiff shell 	and drink are needed to provide
 use annotated sketches, 	materials and components with	investigate and analyse:	structures	energy for the body
cross-sectional drawings and	some accuracy	 who designed and made the 	that a single fabric shape can be	
exploded diagrams to develop	 apply a range of finishing 	products	used to make a 3D textiles product	
and communicate their ideas	techniques, including those from	 where products were designed 	 that food ingredients can be fresh, 	
 use computer-aided design to 	art and design, with some accuracy	and made	pre-cooked and processed	
develop and communicate their		 when products were designed and 		
ideas		made		
In LK52 pupils should also:		 whether products can be recycled 		
 generate realistic ideas, focusing 		or reused		
on the needs of the user		Key events and individuals		
 make design decisions that take 		Across K52 pupils should know:		
account of the availability of		 about inventors, designers, 		
resources		engineers, chefs and manufacturers		
		who have developed		

			YEAR 5			
Dr John T Dorrance invented condensed soup. This innovation revolutionised the soup industry - The Campbell dwelling		Europe's N dwelling by	R / INVENTOR eolithic long housea long, narrow tin uilt in 6000 BC is an excellent examp cture / house		DESIGNER / INVENTOR Sergio Boldrin, born in Venice in 1957, and currently living and working there, is a master mask maker	
PROJECT ON A PAGE Food (Celebrating culture and seasonality including cooking and		PROJECT ON A PAGE Structures Frame structures (kite / bird hide)			PROJECT ON A PAGE Textiles Combining different fabric shapes (including computer aided design) (masks //slippers / hat)	
			YEAR 6			
DESIGNER / INVENTOR Yu Suzuki (born June 10, 1958) is a Japanese game designer, producer, programmer, and engineer, who headed Sega's AM2 team for 18 years.		DESIGNER / INVENTOR The earliest evidence of pulleys dates back to Ancient Egypt in the Twelfth Dynasty (1991-1802 BCE) and Mesopotamia in the early 2nd millennium BCE. In Roman Egypt, Hero of Alexandria (c. 10-70 CE) identified the pulley as one of six simple machines used to lift weights. Gears were invented by the Greek mechanics of Alexandria in the third century B.C., were considerably developed by the great Archimedes, and saw wide use in the Roman world.			DESIGNER / INVENTOR Baker Raffaele Esposito from Naples is often given credit for making the first such pizza pie. Historians note, however, that street vendors in Naples sold flatbreads with toppings for many years before then.	
PROJECT ON A PAGE Electrical systems More complex switches and systems (including programming and control) (electrical board game /alarm for an artefact / quiz boards)		PROJECT ON A PAGE Mechanical systems Pulleys and gears (Lift kits / Electric powered cars)			PROJECT ON A PAGE Food Celebrating culture and seasonality including cooking and nutrition requirements (Pizza)	
(circuitat toura game anam tot an i	Progression Framework for UKS2					
DESIGNING Understanding contexts, users and purposes Acress KS2 pupils should: * work confidently within a range of contexts, such as the home, school, leisure, culture, enterprise, industry and the wider environment	MAKING Planning Across K52 papils should: select tools and equipment suitable for the task explain their choice of tools and equipment in relation to the skills and techniques they will be using		EVALUATING Own ideas and products Across K52 pupils should: • identify the strengths and areas for development in their ideas and products • consider the views of others, including intended users, to	TECHNICAL KNOWLEDGE Making products work Across 832 gapsis should know: • how to use learning from science to help design and make products that work • how to use learning from mathematics to help design and		COOKING AND NUTRITION Where food comes from Across K52 pupils should know: • that a recipe can be adapted a by adding or substituting one or more ingredients • that food is grown (such as tomatoes, wheat and potatoes),

- describe the purpose of their products
- indicate the design features of their products that will appeal to intended users
- explain how particular parts of their products work
- In UK\$2 pupils skould also:
- carry out research, using surveys, interviews, questionnaires and web-based resources
- identify the needs, wants, preferences and values of particular individuals and groups
- develop a simple design specification to guide their thinking

Generating, developing, modelling and communicating

- Aeross KS2 pupils should: • share and clarify ideas through discussion
- model their ideas using prototypes and pattern pieces
 use annotated sketches, cross-sectional drawings and exploded diagrams to develop and communicate their ideas
- use computer-aided design to develop and communicate their
- In UK\$2 pupils should also • generate innovative ideas, drawing on research
- make design decisions, taking account of constraints such as time,

- select materials and component suitable for the task
- explain their choice of materials and components according to functional properties and aesthetic qualities
- In UKS2 pupils should also:
- produce appropriate lists of tools, equipment and materials that they need
- formulate step-by-step plans as a guide to making

Practical skills and techniques

- Aeross K52 pupils should: • follow procedures for safety and hygiene
- use a wider range of materials and components than KS1, including construction materials and kits, textiles, food ingredients, mechanical components and electrical components
- In UKS2 pupils skould also:
- accurately measure, mark out, cut and shape materials and components
- accurately assemble, join and combine materials and components
 accurately apply a range of finishing techniques, including
- finishing techniques, including those from art and design • use techniques that involve a number of steps
- demonstrate resourcefulness when tackling practical problems

- In late K52 pupils should also:
 - critically evaluate the quality of the design, manufacture and fitness for purpose of their products as they design and make
 - evaluate their ideas and products against their original design specification

Existing products Across K52 papils should

- investigate and analyse:
 how well products have been designed.
- designed
 how well products have been
- made

 why materials have been chosen

 what methods of construction
- what methods of construction have been used
- how well products work
 how well products achieve their
- purposes
 how well products meet user needs and wants
- In UK52 pupils should also investigate and analyse:
- how much products cost to make
- how innovative products are
 how sustainable the materials in
- products are
 what impact products have
- what impact products have beyond their intended purpose
- Key events and individuals Across KS2 pupils should know.
- about inventors, designers, engineers, chefs and manufacturers who have developed

- that materials have both functional properties and aesthetic qualities
- that materials can be combined and mixed to create more useful characteristics
- that mechanical and electrical systems have an input, process and output
- the correct technical vocabulary for the projects they are undertaking
- In UK\$2 pupils should also know: • how mechanical systems such as cams or pulleys or gears create movement
- how more complex electrical circuits and components can be used to create functional products
 how to program a computer to monitor changes in the
- monitor changes in the environment and control their products
- how to reinforce and strengthen a 3D framework
- that a 3D textiles product can be made from a combination of fabric shapes
- that a recipe can be adapted by adding or substituting one or more ingredients

- cattle) and caught (such as fish) in the UK, Europe and the wider world
- In late KS2 pupils should also know:
- that seasons may affect the food available
- how food is processed into ingredients that can be eaten or used in cooking

Food, preparation, cooking and nutrition

- Across K52 pupils should know:

 how to prepare and cook a variety
 of predominantly savoury dishes
 safely and hygienically including,
 where appropriate, the use of a heat
 source
- how to use a range of techniques such as peeling, chopping, slicing, grating, mixing, spreading, kneading and baking
- In UKS2 pupils should also know.
- that recipes can be adapted to change the appearance, taste, texture and aroma
- that different food and drink contain different substances nutrients, water and fibre — that are needed for health

4 KEY PRINCIPLES AND PROGRESSION IN DT (split into KS1/KS2)

The following principles are taught and assessed:

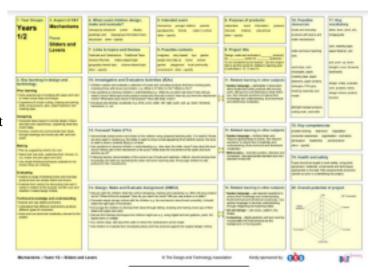
Design

- 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

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

PROJECTS ON A PAGE

At Wormley Church of England Primary School, we chose to adopt *The Projects on a Page* scheme of learning, designed by the Design and Technology Association. It offers an excellent structure for primary school teachers who are non-specialists to teach the National Curriculum for D&T in an imaginative way. It is based on universal principles of effective teaching and learning in D&T. Each DT plan has 20-step planning guidance and accompanying teacher tips, a glossary, an example of iterative design appropriate to the project, and practical advice on using resources. Side 1 of the plan is supplied as an editable digital version that can be adapted and printed.



ASSESSMENT

Teachers assess pupil progress against the school's assessment criteria in Insight at the end of a unit/project. They assess their project using the following tool:

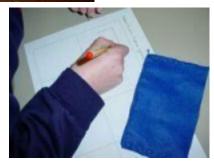
FOCUSSED PRACTICAL TASKS



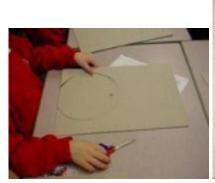








PRODUCTS







Exemplar 1 PUPPETS - Link to Lion King Theater Project

Use a range of puppets to develop pupils' designing skills - Ask a range of questions with increasing cognitive difficulty. (The categories have been taken from Blooms Taxonomy)

Examples of questions. Look carefully and notice:

Knowledge or Recall

Questions designed to build or reinforce core knowledge or terminology • What do we call this?

• Which parts move?

Comprehension

Establishing and reinforcing depth of knowledge

- Can you describe three things about this puppet?
- What makes the puppet move?

Application

Using newly acquired knowledge, ideas and skills in different situations. • Which puppets are made of the same material?

- Which puppet would you use for?
- What other examples are there?

Analysis

Drawing conclusions from information.







- Why has this character been made in this way?
- Why are puppets made in different ways?
- How do we know this puppet is stiffened?

Synthesis

Extended meaning and pattern from information

- What can you tell me about all of these?
- What can you tell me about...?
- · How could we add to, improve, design, solve?

Evaluation

Encouraging critical judgements to be made, often engaging feelings. • Which puppets would you choose for your baby sister?

- Which puppet is the easiest to use?
- · Why?

These photographs demonstrate types of puppets that could be

used. Puppets made by children









Exemplar 2 MASKS - Link to story writing

Make a collection of Masks. Get the pupils to look carefully at the masks, notice details and ask questions that will focus attention on the features of masks.

Activity - pupils work in threes, a questioner, a note taker and pupil with the product who answers the questions.

Questioner – asks questions about the mask- prompting information about detail. **Product Holder** - pupil with product who answers questions **Note taker** - observes how they fulfil their roles and reports back at the end.

The rules can be changed e.g. only ask closed question, only ask open questions, pupil answering the question is not allowed to give additional information. This prepares a design sheet.

Neoprene Masks

Make a mask. Start with a design brief e.g. Design and make a mask which can be worn for a performance of a traditional story.

Build in the success criteria -

Wearer must be able to: see speak clearly move freely





Collect ideas from books, internet, CD Rom, films, posters, other masks.



Design the mask using the design sheet.

(NB Show the children the range of materials before starting to design. Limit the choice from a range of materials e.g. feathers or pipe cleaners, pompoms or feathers, vivelle or neoprene off cuts).

Pupils complete the design sheet in pencil. Photocopy this twice, one to be used for the pattern and the other to add further details (a working design).

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