

## Design and make a Hydraulic Arm



**Pupil Name**

**Key Stage 2 Learning Points (from the National Curriculum) Specific to this project.**

### Design Technology

• D1	work confidently within a range of contexts, such as the home, school, leisure, culture, enterprise, industry and the wider environment
• D2	describe the purpose of their products
• D3	indicate the design features of their products that will appeal to intended users
• D4	explain how particular parts of their products work
• D5	carry out research, using surveys, interviews, questionnaires and web-based resources
• D6	identify the needs, wants, preferences and values of particular individuals and groups
• D7	develop a simple design specification to guide their thinking

### Designing - Generating, developing, modelling and communicating ideas

• D8	share and clarify ideas through discussion
• D9	model their ideas using prototypes and pattern pieces
• D10	use annotated sketches, cross-sectional drawings and exploded diagrams to develop and communicate their ideas
• D11	use computer-aided design to develop and communicate their ideas
• D12	generate realistic ideas, focusing on the needs of the user
• D13	make design decisions that take account of the availability of resources

### Evaluating - Own ideas and products

• E1	identify the strengths and areas for development in their ideas and products
• E2	consider the views of others, including intended users, to improve their work
• E3	critically evaluate the quality of the design, manufacture and fitness for purpose of their products as they design and make
• E4	evaluate their ideas and products against their original design specification

### Evaluating - Existing products

#### Pupils will be taught to investigate and analyse:

• E5	how well products have been designed and made
• E6	why materials have been chosen
• E7	what methods of construction have been used
• E8	how well products work to achieve their purposes
• E9	how well products meet user needs and wants
• E10	how much products cost to make
• E11	how innovative products are
• E12	how sustainable the materials in products are
• E13	what impact products have beyond their intended purpose

<b>Making - Planning</b>	
• M1	select tools and equipment suitable for the task
• M2	explain their choice of tools and equipment in relation to the skills and techniques they will be using
• M3	select materials and components suitable for the task
• M4	explain their choice of materials and components according to functional properties and aesthetic qualities
• M5	produce appropriate lists of tools, equipment and materials that they need
• M6	formulate step-by-step plans as a guide to making
<b>Making - Practical skills and techniques</b>	
• M7	follow procedures for safety
• M8	use a wider range of materials and components than KS1, including construction materials and kits, mechanical components and electrical components
• M9	accurately measure, mark out, cut and shape materials and components
• M10	accurately assemble, join and combine materials and components
• M11	accurately apply a range of finishing techniques, including those from art and design
• M12	use techniques that involve a number of steps
• M13	demonstrate resourcefulness when tackling practical problems
<b>Technical knowledge - Making products work</b>	
• T1	how to use learning from science and maths to help design and make products that work
• T2	that materials have both functional properties and aesthetic qualities
• T3	that materials can be combined and mixed to create more useful characteristics
• T4	that mechanical and electrical systems have an input, process and output
• T5	the correct technical vocabulary for the projects they are undertaking
• T6	how mechanical systems such as cams or pulleys or gears create movement
• T9	how to reinforce and strengthen a 3D framework

<b>Objectives covered from other subject areas</b>	
<b>Maths</b>	
<b>Measurement</b>	Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
<b>Science</b>	
<b>Working Scientifically</b>	
• WS4	using test results to make predictions to set up further comparative and fair tests
• WS5	reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
• WS6	identifying scientific evidence that has been used to support or refute ideas or arguments.
• WS7	explore and talk about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically.
• WS8	recognise that scientific ideas change and develop over time.
• WS9	draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.
• E1	associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit ,the loudness of buzzers and the on/off position of switches
• E2	compare and give reasons for variations in how components function, including the brightness of bulbs,

• E3	use recognised symbols when representing a simple circuit in a diagram.
• E4	construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors.
• E5	learn how to represent a simple circuit in a diagram using recognised symbols.
<b>Forces</b>	
• F3	recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
<b>Properties and changes of materials</b>	
• PM4	give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
<b>Art</b>	
<b>Drawing</b>	
• D1	work on sustained, independent, detailed drawings.
• D2	develop close observational skills
<b>Exploring ideas</b>	use in their work, recording and annotating in sketchbooks.
• E1	create sketch books to record their observations and use to review and revisit ideas.
• E2	record and explore ideas from first hand observations, experience and imagination
• E3	question and make thoughtful observations about starting points and select ideas for different purposes
• E4	think critically about their art and design work.
<p>Evidence for meeting these strands to come from:</p> <p>Teacher observations and questioning pupils during project.</p> <p>Pupil design sheet.</p> <p>Pupils Self-Assessment on evaluation sheet.</p> <p>Peer Assessment on evaluation sheet.</p> <p>Photographs taken during making / testing process.</p>	

## Key Stage 2 Learning Points (from the National Curriculum 2014) Generic to all Imagineering Projects

### Science: Health and Safety - Pupils should be taught to:

- recognize that there are hazards in materials and physical processes, and assess risks and take action to reduce risks to themselves and others

### Design and Technology: Knowledge, skills and understanding

Working with tools, equipment, materials and components to make quality products:

#### Pupils should be taught to:

- select tools, techniques and materials for making their product from a range suggested by the teacher
- suggest alternative ways of making their product, if first attempts fail
- explore the sensory qualities of materials and how to use materials and processes
- measure, cut and shape a range of materials

### Evaluating processes and products:


Pupils should be taught to:

- reflect on the progress of their work as they design and make, identifying ways they could improve their products
- carry out appropriate tests before making any improvements

### Design and Technology: Breadth of study

During the key stage, pupils should be taught the knowledge, skills and understanding through:

- focused practical tasks that develop a range of techniques, skills, processes and knowledge
- design and make assignments using a range of materials, including electrical and mechanical components

<b>Pupil Project Record</b>		<b>Date</b>
<b>Name</b>	<b>Title of Project</b>	
<p>Before you begin your project... Draw a picture of what you think it will look like.</p> <p>Who are you making it for?</p> <p>What safety rules will you need to follow? Why?</p>		
<p>When you have finished your project... Draw and label a picture of your design. Use arrows to explain how it works.</p>		
<p>What do you think of your finished project? What happened during testing?</p>		
<p>What would you change/improve if you did it again? Could you make it more attractive?</p>		
<p>What skills did you use to build it?</p>		
<p>What does your partner think?</p> <p>Give it a star rating out of 5 stars </p>		