

***Our Intent is: To support our pupils in answering the question, "How do we design, make and evaluate solutions to real and relevant problems?" Using creativity and innovation, we inspire pupils to develop skills which impact on daily life.***



**Forton Primary School  
Design and Technology**

**Pendle Class  
Spring 1  
Year B**

**N.C. LINKS: Design and Technology**

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

**Key Concept: Mechanical systems**

**Focus : Pulleys or Gears**

**Key Question: What happens if you use longer levers to use very light objects to raise heavy objects?**

**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

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|   | <ul style="list-style-type: none"><li>• evaluate their ideas and products against their own design criteria and consider the views of others to improve their work</li><li>• understand how key events and individuals in design and technology have helped shape the world</li><li>• <b>Technical knowledge</b></li><li>• apply their understanding of how to strengthen, stiffen and reinforce more complex structures</li><li>• understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]</li><li>• understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors]</li><li>• apply their understanding of computing to program, monitor and control their products</li></ul> |
| <p><b>Unit Overview:</b> To use a system of pulleys and gears to make models move.</p>  | <p><b>Vocabulary:</b></p> <p>pulley, drive belt, gear, rotation, spindle, driver, follower, ratio, transmit, axle, motor</p>   |
| <p><b>Possible Outcome:</b></p> <p>fairground ride with gears or pulleys e.g. carousel, Ferris wheel<br/>controllable toy vehicle with gears or pulleys e.g. dragster, off-road vehicle, sports car, lorry, window display with moving parts e.g. lifting or turning items for sale</p> | <p>circuit, switch, circuit diagram</p> <p>annotated drawings, exploded diagrams</p> <p>mechanical system, electrical system, input, process, output</p>   |

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|  | design decisions, functionality, innovation, authentic, user, purpose, design specification, design brief |
| <b>Intended User:</b><br><br>peers    siblings    younger children    older children    specific<br>individuals    target groups   |   |
| <b>Building on Prior learning when B follows A:</b> <ul style="list-style-type: none"><li>• Experience of axles, axle holders and wheels that are fixed or free moving.</li><li>• Basic understanding of electrical circuits, simple switches and components.</li><li>• Experience of cutting and joining techniques with a range of materials including card, plastic and wood.</li><li>• An understanding of how to strengthen and stiffen structures.</li></ul>   |   |
| <b>Key Skills (Disciplinary)</b><br><b>Designing</b> <ul style="list-style-type: none"><li>• Generate innovative ideas by carrying out research using surveys, interviews, questionnaires and web-based resources.</li><li>• Develop a simple design specification to guide their thinking.</li><li>• Develop and communicate ideas through discussion, annotated drawings, exploded drawings and drawings from different views.</li></ul> <b>Making</b> <ul style="list-style-type: none"><li>• Produce detailed lists of tools, equipment and materials. Formulate step-by-step plans and, if appropriate, allocate tasks within a team.</li></ul> |   |

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- Select from and use a range of tools and equipment to make products that are accurately assembled and well finished. Work within the constraints of time, resources and cost.

### **Evaluating**

- 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 and understanding**

- 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.

### **Sequence of Lessons:**

#### **1. Investigative and Evaluative Activities**

- Investigate, analyse and evaluate existing everyday products and existing or pre-made toys that incorporate gear or pulley systems. Use videos and photographs of products that cannot be explored through first-hand experience.
- Use observational drawings and questions to develop understanding of each product in the collection e.g. *How innovative is the product? What design decisions have been made? What type of movement can be seen? What types of mechanical components are used and where are they positioned? What are the input, process and output of the system? How well does the product work? Why have the materials and components been chosen? How well has it been designed? How well has it been made?*
- Children could research and, if possible, visit engineering and manufacturing companies that are relevant to the product they are designing and making e.g. Jaguar Land Rover, JCB, local companies

#### **2. Focused Tasks**

- Using a construction kit, investigate combinations of two different sized pulleys to learn about direction and speed of rotation e.g. *How many times does the smaller pulley turn each time the larger pulley turns once? Do the pulleys move in the same direction? How can you reverse the direction of rotation?*

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AND/OR

- Using a construction kit, explore combinations of two different size gears meshed together. Investigate the direction and speed of rotation focusing on how the size of the driver gear affects the speed of the follower gear. Ask the children to use the number of teeth on each gear to decide upon the gear ratios e.g. 10 tooth driver gear meshed with a 20 tooth follower gear produces a ratio of 2:1
- Build a working circuit that incorporates a battery, a motor and a handmade switch, such as a reversing switch. Demonstrate the accurate use of tools and equipment including cutting and stripping wire, and making secure electrical connections. Remind children about the dangers of mains electricity. Draw a pictorial representation of the circuit or draw a circuit diagram using correct symbols.
- Develop measuring, marking, cutting, shaping and joining skills using junior hacksaws, G-clamps, bench hooks, square section wood, card triangles and hand drills to construct wooden frames, as appropriate. Demonstrate the accurate use of tools and equipment.

### **3. Design, Make and Evaluate Assignment**

- Develop an authentic and meaningful design brief with the children.
- Children generate innovative ideas by carrying out research including surveys, interviews and questionnaires and develop a design specification for their product, carefully considering the purpose and intended user for their product.
- Communicate ideas through detailed, annotated drawings from different views and/or exploded diagrams. The drawings should indicate the design decisions made, including the location of the mechanical and electrical components, how they work as a system with an input, process and output, and the appearance and finishing techniques for the product.
- Produce detailed step-by-step plans and lists of tools, equipment and materials needed. If appropriate allocate tasks within a team.
- Make high quality products, applying knowledge, understanding and skills from IEAs and FTs. Children should use a range of decorative finishing techniques to ensure a well finished final product that matches the intended user and purpose.
- Evaluate throughout and the final product in use, comparing it to the original design specification. Critically evaluate the quality of the design, the manufacture, functionality, innovation shown and fitness for the intended user and purpose.

**Enhancements: N/A**

**End of Unit Outcome: Moving model**