

Design and Technology – Year 6

Content- Mechanisms- Pulleys and Gears

Big Question: How does CAD aid the development of a prototype?

NC objectives - areas of study	End point of area of study	Vocabulary		
<p>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.</p> <p>Children should understand and use mechanical systems in their products. They 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. They generate, develop, model and communicate their ideas through discussion, annotated sketches, cross sectional and exploded diagrams, prototypes, pattern pieces and computer aided design.</p> <p>They can select from and use a wider range of tools, equipment to perform practical tasks accurately.</p> <p>They can select from and use wider range of materials and components, including construction materials and textiles according to their functional properties and aesthetic qualities.</p> <p>They can investigate and analyse a range of existing products.</p> <p>Children evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.</p>	<p><u>Mechanisms</u></p> <p>Understand that mechanical and electrical systems have an input, process and an output.</p> <p>Understand how gears and pulleys can be used to speed up, slow down or change the direction of movement. Children will be able to use the correct technical vocabulary when designing and describing their product.</p> <p>Children will develop their knowledge and understanding of pulleys and gears through the use of construction kits and exploring gear ratios.</p> <p>Children will be able to create pulleys that move in the same direction or different directions.</p>	Basic	Adventurous	Technical
		<p>Batteries, battery holders, wires, clips, motors, switches, junior hacksaws, G-Clamps, bench hooks, hand drills, automatic wire strippers.</p>	<p>Functionality Innovation Authentic Purposeful engineer</p>	<p>drive belt, ratio, axle, diagram, annotated drawings, exploded diagrams, mechanical systems, electrical systems, input, process, output, pulley, gear</p>

<p>They can understand how key events and individuals in design and technology have helped shape the world.</p> <p>They can apply understanding of computing to programme, monitor and control their products.</p>				
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Knowledge

Substantive Knowledge

Mechanisms- concepts- **Significance** and **Innovation**

Lesson 1:

LO: To understand the impact of Elon Musk as an innovator and engineer.

Vocabulary- innovate, engineer, electrical systems

Significance- Elon Musk- Innovator, entrepreneur and engineer- created of many mechanisms including electric car.

Investigate inventions, challenges, life and impact on society.

Children to create an innovative product based upon the development of Elon Musk and his creations but also think about improvements. Ensure children understand how Elon took creative risks and wasn't always successful to start.

[Review and evaluate created things. \(others\)](#)

Lesson 2:

LO: To know what gears and pulleys are and recognise them in existing products.

Vocabulary- gear, belt, drive, pulley

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

Disciplinary Knowledge

Each lesson: Tell chn- Explain to the children that today we are going to be mechanics/engineers. Engineers are professionals that invent, analyse, invent, build, test machines, complex systems and create gadgets.

Throughout the unit, children will be able to draw upon other subject disciplines such as Mathematics, Science and Art. This will include the following:

Spoken language – ask relevant questions, formulate and express opinions, give well-structured descriptions and explanations. Use relevant strategies to build their vocabulary.

Mathematics – understand ratios. Apply understanding and skill to carry out accurate measuring using standard units i.e. cm/mm.

Science – apply knowledge and understanding of circuits, switches, conductors and insulators. Recognise that some mechanisms, including pulleys and gears, allow a smaller force to have a greater effect.

Computing – use search technologies for research purposes and be discerning when evaluating digital content.

Art and design – use and apply drawing skills. Use techniques with colour, pattern, texture, line and shape.

Science – apply knowledge and understanding of circuits, switches, conductors and insulators in the design of the final product.

experience. 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

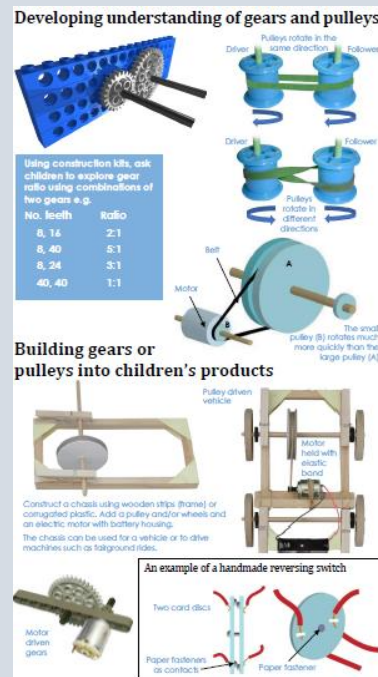
Lesson 3:

LO: To understand how gears and pulleys can be used to adjust movement.

Vocabulary- ratio, axle

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?*

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. Explore using different ratios.



Lesson 4:

LO: To know how to communicate ideas through detailed and annotated drawings.

Vocabulary- annotate drawings, process, exploded diagrams

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

Mathematics – understand ratios. Apply understanding and skill to carry out accurate measuring using standard units i.e. cm/mm.

Children to follow the four aspects of Design and Technology- research, design, make and evaluate whilst building upon technical knowledge to make their finished product.

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.

[Celebrating and enjoying personal creativity. \(Self\)](#)

Lesson 5:

LO: To know how to make a wheeled product with accuracy.

Vocabulary- axle, gear, pulley

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. Make high quality products, applying knowledge, understanding and skills from previous lesson. Children should use a range of decorative finishing techniques to ensure a well finished final product that matches the intended user and purpose.

[\(Retrieval year 2 and 5- Use of axles and wheels and using triangulation to create a frame structure.\)](#)

Lesson 6:

LO: To know how to evaluate a product against a design brief.

Vocabulary – evaluate, input, output, mechanical system.

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.

Concepts

Functionality

Authenticity

Innovation

Significance

When designing and making, pupils need some scope to be original with their thinking.

Projects that encourage innovation lead to a range of design ideas and products being developed and are characterised by engaging open-ended starting points for learning.

Demonstrate some originality when designing and making.

Learn how to take creative risks.

Understand the meaning of 'innovation' within design and technology.

Understand how innovation is an important part of the process of designing and making products.

ASSESSMENT

KNOW MORE, REMEMBER MORE, DO MORE...

In this unit of learning, progress has been made when a learner knows more. This 'distance travelled' from the starting point is evidenced through them remembering more and doing more: in books, low stakes quizzes, retrieval, use of mind maps, answering the big question and being able to feel more confident about this unit.