DT – Moving Mechanisms KS2 (3,5,6)

Year 3 NC - pupils should be taught to:	Design, make and evaluate moving posters How we do this in Year 3	Year 3 Vocabulary / Glossary
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** • evaluate their ideas and products against their own design criteria and consider the views of others to improve their work; **Technical Knowledge** • understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages];	Investigate mechanical systems which use levers and linkages. Make mechanical systems which use levers and linkages, demonstrating knowledge of difference between the two. Discuss ideas for design criteria by thinking about purpose and who the poster is for (user). Develop ideas using annotated sketches to show the parts which will move, including features of design criteria when creating sketches (function). Use prototypes to develop ideas, test materials and carry out practical tasks safely (e.g making a hole with a pointed object). Clearly, plan stages of making, use notes and images. Discuss and evaluate prototypes against design criteria and refine / adapt design accordingly. Basing decisions on investigations / tests, select the correct tools and equipment to make own moving poster. Use tools to accurately cut, shape and join paper and card. Explore finishing techniques (e.g.digital graphics, blending / hiding mechanism parts). Introduce new materials and techniques into product to create a high-quality finish. Demonstrate a clear understanding of mechanical systems by explaining the function of the levers, linkage, loose pivot and fixed pivot. Complete a final evaluation of product against the design criteria, highlighting strengths and identifying areas of improvement.	**Design brief** - a key project planning document that clearly explains what the project has to achieve, how it will be achieved, and within what time frame. **Mechanical system** – contains related components which act together to create a motion. Systems have an input, process and an output. In a lever and linkage mechanism, the 'input movement' is where the user pushes or pulls a card strip. The 'output movement' is where one or more parts of the picture move. **Mechanism** - a device used to create movement in a product. **Lever** - The simplest type of mechanism is called a **lever**. A lever is a stiff bar which moves around a pivot. The pivot can be **loose** or **fixed**. Levers are used in many products. **Linkage** - the card strips joining one or more levers to produce the type of movement required. The term 'linkage' is also used to describe the lever and linkage mechanism as a whole. **Slot** - the hole through which a lever is placed to enable part of a picture to move. **Guide or bridge** - a short card strip used to keep lever and linkage mechanisms in place and control movement. **Prototype** - a prototype normally looks and works like the real thing. It is the first example and there may be some problems with it which will probably need changing. The prototype model will be used for testing, development and evaluation.

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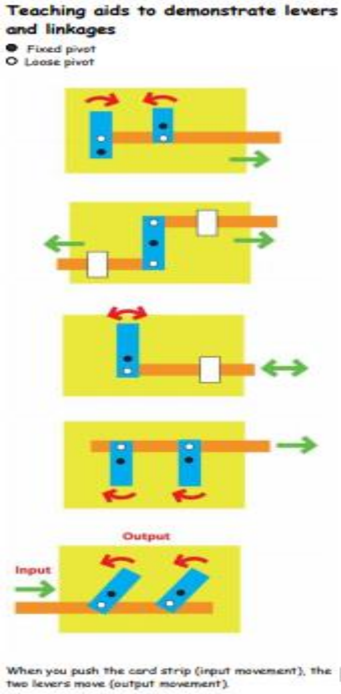
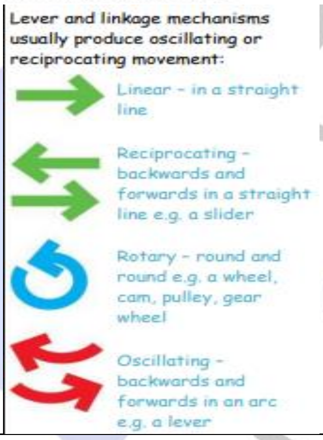
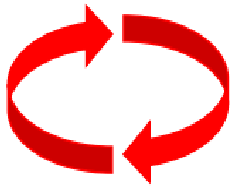
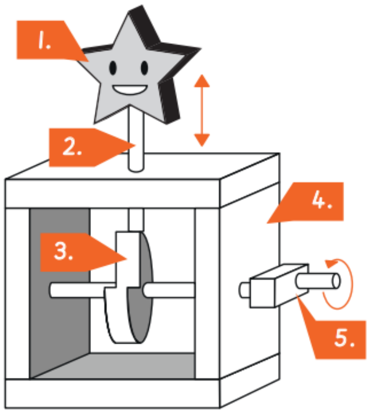
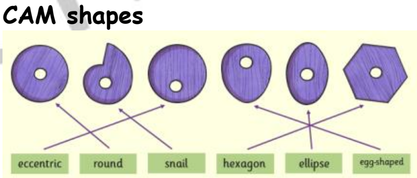
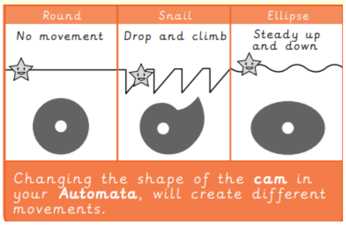
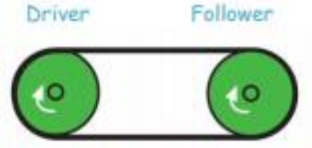
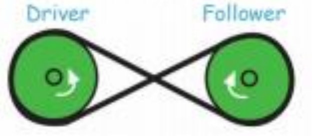
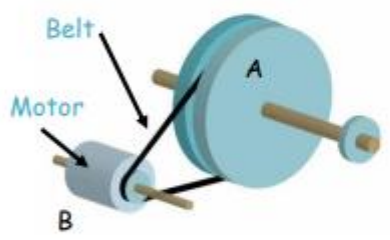
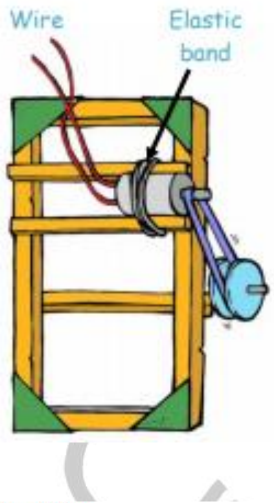
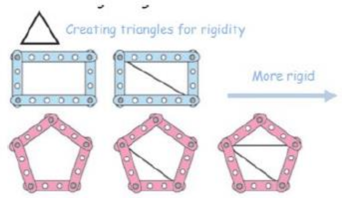
		 

Year 5 NC - pupils should be taught to:	**Design, make and evaluate a moving animal toy** **How we do this in Year 5**	**Year 5** **Vocabulary / Glossary**
Design • use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed 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; **Technical Knowledge** • apply their understanding of how to strengthen,	Introduced to design brief and research different animals to inform design using a range of sources. Explain how CAMs mechanisms work by identifying cams and follower. Explain how rotary motion is converted into linear motion in a mechanical system. Explore cam movement by select materials according to their functional properties to make simple cams mechanisms. Explain why the material is fit for the purpose. Change the shape of the cam to see how this changes the movement of the follower and explain what happens. Research and develop design criteria to inform design by focusing on: - customer - aesthetics - function - ergonomics - quality - usability - environment - safety Safely build a framework using a wide range of tools and equipment, i.e. wood, hacksaw, bench hook, clamp, card triangles etc. Cut wood accurately to 1mm. Improve design by taking on peer feedback / views by sharing and discussing design. Select materials to successfully use to make the cams from. Accurately measure and cut the dowel wood for use as the axle/shaft for the cams to turn on. Use tools and materials to make a handle to work the mechanical system. Make adjustments to the mechanical system to make it run well. Use the design criteria to inform final evaluation.	Cam - is a rotating or sliding piece in a mechanical linkage used especially in transforming rotary motion into linear motion. The follower is a rod that rests on the edge of a turning cam. Axle – the axle rotates, turning the cam with it. Frame – the rectangular structure which holds the automata together. Linear motion – straight line  Rotary motion – turning in a circle  Automata toy **components**: 1. Character 2. Follower 3. Cam 4. Frame 5. Axle attached to handle  **CAM shapes**  

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];		

Year 6 NC - pupils should be taught to:	Design, make and control a rotating Fairground ride How we do this in Year 6	Year 6 Vocabulary / Glossary
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	Understand how key events and individuals in design and technology have helped shape the world by studying the development of fairground rides https://www.sheffield.ac.uk/nfca/researchandarticles/fairgroundrides Investigate fairground rides which have rotating parts, thinking about how they move, what are the components that join them together and the mechanisms that make them work by labelling different pictures of fairground rides. Create a pulley and belt system using electric components (batteries, motor, wires) and compare to earlier made circuit. Explore and investigate electrical motors and how they make fairground rides rotate. Investigate the mechanism (belt and pulley system) which turns the ride by using appropriate materials to create a circuit. Explain how the mechanism works using appropriate technical vocabulary (belt, pulley, axle, rotation, motor). Recap on electrical circuits and explore how light components are including in fairground rides. Explore purpose / effect. Recap on woodwork in year 5 to consider what materials will create an effective stable framework. Develop design criteria with inclusion of light(s) and moving mechanisms to inform design by focusing on: - aesthetics - function - ergonomics - quality - usability - environment - safety Sketch and annotate an exploded design of circuits, labelling using appropriate scientific and technical vocabulary.	function, innovative, design specification, design brief, user, purpose design brief, design specification, prototype, annotated sketch, purpose, user, innovation, research, functional, mock-up, prototype pulley, drive belt, rotation, spindle, driver, follower, motor circuit, circuit diagram, annotated drawings, exploded diagrams, mechanical system, electrical system, input, process, output Pulley – a grooved wheel over which a drive belt can run. 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. Motor spindle – the rod on the end of the motor onto which a gear or pulley is attached. Triangulation – the use of triangular shapes to strengthen a structure.  The pulleys rotate in the same direction  The pulleys rotate in different directions  The small pulley (B) rotates much more quickly than the large pulley (A)

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];	Formulate a step-by-step plan to guide making, listing tools, equipment, materials and components. Make a mock-up of their fairground ride in which a motor successfully drives a rotating part Make modifications to the model as necessary. Competently select from and use appropriate tools to accurately measure, mark, cut and assemble materials, and securely connect electrical components to produce reliable, functional products. Ensure they are working safely and carefully when using a hacksaw and bench hook to cut wood accurately. Use a glue gun safely. Strengthen joins by using card triangles (triangulation) or pin nails. Use finishing and decorative techniques suitable for the product they are designing and making. Test the system to demonstrate its effectiveness for the intended user and purpose. Critically evaluate their products against their design specification, intended user and purpose, identifying strengths and areas for development, and carrying out appropriate tests.	 **Triangulation** ⇒ Triangulation involves the use of triangular shapes to give stability to structures.  https://www.youtube.com/watch?v=mBHJtWbsiaA—strong structures with triangles. Joining thin wood