



Subject: Design Technology

Mechanical Toy - Cams

Overarching Topic:

Why is this topic being studied at this time?

Students will understand and evaluate the efficiency of mechanical devices to improve societies working infrastructures like transport, sports, industry and domestic life. They will apply this understanding to design and make a toy that uses a cam mechanism to create dynamic movement. (Critical)

How does it fit into the wider subject curriculum?

Students will study the four types of mechanical movement and how can we, as designers, take advantage of this to solve complex real-world problems without the use of electronic aids. They will be able to identify and understand how all types of mechanical movement is utilised by engineers and designers to solve real-world problems and apply this to creating a unique and innovative moving toy with a cam device of their choosing (Core) Students learning will be contextualized by current energy crisis both environmentally and domestically. Students will understand and analyse the advantages of using human-operated mechanical devices to overcome working problems that energy shortages could present. Ultimately learners will apply their knowledge of mechanics to theorize what the world could look like if natural resources ran out and how we could re-design society around man-operated machines as a pinnacle activity. (Pinnacle)

This project will aid in contextualising energy systems, forces and gears that constitute part of the broader KS4 curriculum in Design & Technology. It also has ties to skills acquired in Y7 *Skills Bar* project, *Passive Amplifier* and will provide a pivotal moment in the development/refinement of woodworking skills necessary for successful completion of the *Timber-based Design Strategies* and *Sustainable Living* projects later in Y9.

Joining up:

Students learning will be contextualized by a basic understanding of energy systems in KS3 Science.

Students will have the opportunity to refine skills acquired in KS3 Maths such as:

- Measuring and marking out.
- Using a protractor to determine an angle.
- Establishing and using a datum point.

Students will develop skills acquired and explored in KS3 Art & Design including:

- Sketching and designing with reference to shading.

	Essential	Core	Ambitious
The Big Questions (What questions will students be able to answer upon mastery of the topic?)	<ol style="list-style-type: none"> 1. Can students name a type of mechanical movement? 2. Can students identify and name a type of mechanical cam? 3. Can students identify and explain the function of one working component in a Mechanical Toy? 4. Can students sketch a basic design for a <i>Mechanical Toy</i> that indicates some understanding of moving components inside a cam mechanism? 	<ol style="list-style-type: none"> 1. Can students name all four types of Mechanical movement? 2. Can students identify all types of mechanical movement? 3. Can students give real-world examples of a type of mechanical movement? 4. Can students identify and name all four core mechanical cam types? 5. Can students identify and explain the function of all working components in a Mechanical Toy? 6. Can students sketch a comprehensive design for a <i>Mechanical Toy</i> that shows clear understanding of moving components inside a cam mechanism? 	<ol style="list-style-type: none"> 1. Can students explain potential uses and applications for the four types of mechanical movement? 2. Can students explain how you might use cam-based mechanics to solve complex working problems? 3. Can students demonstrate how you might design a cam mechanism to solve a design problem? 4. Can students sketch a series of annotated designs for complex cam-based toys that include multiple moving toy-components?
The Key Skills/ Techniques	The sophistication and application of skills will become more advanced as students' progress through the essential, core and ambitious knowledge		
	Skill/Technique	How will this skill be developed?	
	Product Analysis	Students will analyze existing mechanical toys and establish how their mechanics act to create dynamic movement.	
	Sketching	Students will explore free-hand sketching of design ideas, this will be developed into annotated sketching and finally comprehensive design drawings that use color and shading to communicate ideas.	
	Converting 2D designing into 3D products	Student will develop design ideas through sketching before applying these ideas to practical making processes including working with timber-based modeling materials and tools.	
	Modelling techniques	Students will develop their skills with model making techniques by exploring making some card models and applying that skill to wood-working	
Technical Skills	Using basic hand-tools to manufacture and assemble a wooden armature for a mechanical device. Including the measuring, marking and cutting out of the dynamic and static toy components from MDF that students would have designed and sketched.		

	Product & Skills Evaluation	Students will have the opportunity to use Quality Control & Quality Assurance methods, learned and instilled throughout KS3, to identify and asses their own ability level and reflect on actions they could take to improve next time.
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