

# 1. Year Groups

# Years 5

# 2. Aspect of D&T

# Mechanical systems

## Focus

## Cams

**4. What could children design, make and evaluate?**  
 a shop display with moving parts e.g. lifting or rotating images of items for sale  
 a vehicle incorporating cam-driven components  
 a toy with oscillating, rotating or reciprocating movement  
 other – specify

**7. Links to topics and themes**

Toys and Games	Our Community
Forces and Motion	Mini-enterprise
Festivals	Celebrations
other – specify	

**5. Intended users**

peers siblings younger children  
 older children shoppers  
 specific individuals target groups  
 company other – specify

**8. Possible contexts**

shops home school local community  
 leisure enterprise wider environment  
 engineering manufacturing other – specify

**6. Purpose of products**

business entertainment pleasure play  
 educational interests and hobbies  
 other – specify

**9. Project title**

Design, make and evaluate a \_\_\_\_\_ (product) for \_\_\_\_\_ (user) for \_\_\_\_\_ (purpose).

To be completed by the teacher. Use the project title to set the scene for children's learning prior to activities in 10, 12 and 14.

**16. Possible resources**

videos and photographs of cams, models or toys with different cam mechanisms  
 MDF, card or wooden wheels, plastic or wooden cams, dowel, card boxes, PVA glue, masking tape, double-sided tape, square section wood, card, corrugated plastic, finishing media

junior hacksaws, glass paper, G-clamps, bench hooks, hand drill

**17. Key vocabulary**

cam, snail cam, off-centre cam, peg cam, pear shaped cam  
 follower, axle, shaft, crank, handle, housing, framework  
 rotation, rotary motion, oscillating motion, reciprocating motion  
 annotated sketches, exploded diagrams

mechanical system, input movement, process, output movement

design decisions, functionality, innovation, authentic, user, purpose, design specification, design brief

## 3. Key learning in design and technology

**Prior learning**

- Experience of axles, axle holders and wheels that are fixed or free moving.
- Basic understanding of different types of movement.
- Experience of cutting and joining techniques with a range of materials including card, plastic and wood.
- An understanding of how to strengthen and stiffen structures.

**Designing**

- Generate innovative ideas by carrying out research using surveys, interviews, questionnaires and web-based resources.
- Develop a simple design specification to guide their thinking.
- Develop and communicate ideas through discussion, annotated drawings, exploded drawings and drawings from different views.

**Making**

- Produce detailed lists of tools, equipment and materials. Formulate step-by-step plans and, if appropriate, allocate tasks within a team.
- Select from and use a range of tools and equipment to make products that that are accurately assembled and well finished. Work within the constraints of time, resources and cost.

## 10. Investigative and Evaluative Activities (IEAs)

- Discuss with the children different types of movement: rotary, oscillating and reciprocating. Make simple models of different types of cams or have toys in which the cam mechanisms can be seen. Use videos, photographs and computer animations of products that cannot be explored through first-hand experience.
- Encourage children to look for different types of movement in the home and in school.
- Use observational drawings and questions to develop understanding of the products in the handling collection and those that children have researched 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 movement, process and output movement 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. car engine manufacturers

## 12. Focused Tasks (FTs)

- Give children pre-cut cams made from MDF or wooden wheels to mount on a piece of board and observe their movement with a follower.
- Demonstrate how to use a hand drill safely to make an off-centre cam and position it accurately in a housing. Ensure children secure the wheel with a G-clamp and use a piece of scrap wood under the wheel to avoid drilling through the bench hook or table. Stress the importance of measuring accurately and checking before cutting any holes or gluing. It is important to line up the cam and follower otherwise the mechanism may not work smoothly. *How high will the cam lift the follower?*
- Develop measuring, marking, cutting, shaping and joining skills using junior hacksaws, G-clamps, bench hooks, square section wood, card triangles and hand drills to make cam mechanisms and construct wooden frames or card housings, as appropriate. Demonstrate the accurate and safe use of tools and equipment.

## 11. Related learning in other subjects

- **Spoken language** – ask relevant questions, formulate and express opinions, give well-structured descriptions and explanations. Listen and respond appropriately, articulate and justify answers, arguments and opinions. Consider and evaluate different viewpoints.
- **Computing** – use search technologies for research purposes and be discerning when evaluating digital content.
- **Science** – forces and movement: explore the effects of simple machines on movement.

## 13. Related learning in other subjects

- **Spoken language** – listen and respond appropriately. Use relevant strategies to build their vocabulary.
- **Science** – identify and compare the suitability of a variety of everyday materials for particular uses.
- **Mathematics** – use mathematical vocabulary to describe position, direction and movement.

## 14. Design, Make and Evaluate Assignment (DMEA)

- Compare the final product to the original design specification.
- 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 sketches from different views and/or exploded diagrams. The drawings should indicate the design decisions made, including the location of the components, how they work as a system 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.
- Understand how cams can be used to produce different types of movement and evaluate the design, the manufacture, functionality, innovation shown and fitness for the intended user and purpose.
- Know and use technical vocabulary relevant to Cams

## 15. Related learning in other subjects

- **Art and design** – use and apply drawing skills. Use techniques with colour, pattern, texture, line and shape.
- **Science** – explore the effects of simple machines on movement.
- **Mathematics** – choose and use appropriate standard units (i.e. cm/mm) to estimate and accurately measure length/height.

## 18. Key competencies

problem-solving teamwork negotiation  
 consumer awareness organisation motivation  
 persuasion leadership perseverance  
 other – specify

## 19. Health and safety

Pupils should be taught to work safely, using tools, equipment, materials, components and techniques appropriate to the task. Risk assessments should be carried out prior to undertaking this project.

## 20. Overall potential of project

