Unit 5C  Moving toys
Focus – control: mechanisms

ABOUT THE UNIT

Children learn about controlling movement with a cam mechanism as part of a simple toy. The purpose of the toy is negotiated with the children. They develop their designing skills by using information sources to generate ideas and formulate an understanding of how cam mechanisms can be used to produce movement. They extend their making skills by developing techniques in cutting, shaping and joining to combine components and by selecting tools and equipment to measure and cut accurately. Through these activities they gain an understanding of the working characteristics of the materials and components and how they can be combined to create more useful properties. They consider both functional and decorative attributes in a finished product.

This unit can be adapted by using an alternative context for the design and make assignment e.g. a vehicle or moving display.

EXPECTATIONS

at the end of this unit
most children will:

have used their knowledge of the movement made by the cam in the design of their toy; have produced sketches and step-by-step plans and identified tools and materials; have measured, marked out and cut accurately, evaluating their work as it develops and at the end

some children will not have made so much progress and will:

have generated one viable idea after discussion with the teacher; have assembled a simple mechanism as part of the design; have used tools with some accuracy and finished their toy in a design that they have prepared with some assistance through discussion, have sketched ideas using their knowledge of mechanisms; have tested these ideas through prototypes before developing a set of plans to work from; have made a model which is accurate, functions well and is well finished and appropriate for the user; have compared their model to the original plan when evaluating and suggested ways to improve the finished product; have considered other ideas for cam-based toys not cas ed in a box

some children will have progressed further and will:

have used their knowledge of the movement made by the cam in the design of their toy; have produced sketches and step-by-step plans and identified tools and materials; have measured, marked out and cut accurately, evaluating their work as it develops and at the end

VOCABULARY

In this unit, children will use words and phrases relating to:

designing eg sequence, annotated diagram, sketch, decision, choice, prototype, model, communicate

making eg shape, assemble, accurate, saw, mark out

knowledge and understanding eg cam, mechanism, movement, linear motion, rotary motion, pivot, off-centre, axle, force, framework, follower, guide, offset, shaft

RESOURCES

• a collection of toys containing cams
• construction kits
• stiff sheet materials, eg card, foamboard, corrugated plastic, prepared cams (shaped and off-centre wheels)
• wooden wheels, doweling, cardboard boxes or wooden frames
• PVA glue, masking tape
• tools and equipment – bench hooks, saws, hand drill, G-cramp, round file, single-hole punch, paper drill, metal safety ruler, craft knife, cutting mats and glue gun (for teacher use)

PRIOR LEARNING

It is helpful if the children have:

• learnt how to handle tools safely
• learnt about the working characteristics of some sheet materials
• made models with construction kits

This unit builds on Units 1B ‘Playgrounds’, 2C ‘Winding up’ and 3C ‘Moving monsters’.

It also builds on Science Units 1E ‘Pushes and pulls’, 2E ‘Forces and movements’ and 4E ‘Friction’.

YEAR 5
### LEARNING OBJECTIVES
**Children should learn**

<table>
<thead>
<tr>
<th>Investigative, disassembly and evaluative activities (IDEAs)</th>
<th>Focused practical tasks (FPTs)</th>
<th>Design and make assignment (DMA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• to recognise the movement of a mechanism within a toy or model</td>
<td>• to measure and mark out accurately</td>
<td>• to consider the characteristics of the cam mechanism when designing the moving part of the toy</td>
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<tr>
<td>• to understand that a cam will change rotary motion into linear motion</td>
<td>• to use tools for cutting safely and effectively</td>
<td>• to test out their design ideas before proceeding</td>
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<td>• to understand that different shapedcams produce different movements</td>
<td>• to use a drill to make an off-centre hole in a wheel</td>
<td>• to cut and join with accuracy to ensure accuracy</td>
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<tr>
<td>• about the relationship between a cam and a follower</td>
<td>• to draw and label the toys to show how the cam mechanism works</td>
<td>• how to evaluate it personally and seek evaluation from others</td>
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#### LEARNING OUTCOMES
**Children**

<table>
<thead>
<tr>
<th>LEARNING OUTCOMES</th>
<th>POINTS TO NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• identify the cam within a mechanism and explain how it changes movement</td>
<td>Links to this unit</td>
</tr>
<tr>
<td>• use a construction kit to model a cam mechanism</td>
<td>Design and technology: Units 6C ‘Fairground’, 6D ‘Controllable vehicles’</td>
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<tr>
<td>• recognise the role of a cam and its follower in a mechanism and how cams produce movement</td>
<td>Science: Unit 6E ‘Balance and unbalanced forces’</td>
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<td>• measure accurately when marking out and drilling a hole in a wooden wheel</td>
<td>Information technology: Unit 5E ‘Controlling devices’</td>
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<td>• use sharp tools correctly to ensure safety</td>
<td>Literacy: Highlight sequence and the need for essential details only in the use of storyboards as a planning device</td>
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#### POSSIBLE TEACHING ACTIVITIES

**IDEA**

- Investigate a collection of moving toys that contain a cam mechanism. Ask questions eg Which parts turn? Which parts move? How are the different parts attached to allow free movement? How are the moving parts guided into place?
- Look in more detail at the moving part of the toy eg a person moving up and down. Why has the designer chosen this idea? What else could be used to make it move up and down?
- Make models using construction kits to look more closely at the movement made by a cam. Ask similar questions to those above to guide children in making observations about the movement and how parts are joined together.
- Discuss the importance of the decoration surrounding the mechanism which gives the product its finished quality.

**FPT**

- Show how to use a flat file to cut and join with accuracy.
- Ask the children to brainstorm ideas for a moving toy for a particular person, sketching their most effective designs. Encourage the children to model their ideas in card and paper first to test their designs, giving them an opportunity to suggest alternatives.
- When planning, the children should develop a clear sequence of how the materials and tools should be used and how the making of the toy will proceed. This could be done as a storyboard.
- Remind the children how to use some of the tools safely.
- Stress the importance of attaching the cam securely to ensure an accurate movement.
- Ask the children to evaluate the product against their design criteria and seek evaluations from others.

#### DESIGN AND MAKE ASSIGNMENT (DMA)

** DMA**

- Aim of unit: Students are faced with a situation where they are designing and making a toy for a particular person. They are encouraged to come up with their own ideas.

**Possible teaching activities**

- To make sure that students are able to carry out practical tasks.
- To ensure that students are able to recognise different movements.
- To make sure that students are able to understand how the materials and tools are used.

**Possible teaching outcomes**

- To recognise the movement of a mechanism within a toy or model.
- To understand that a cam will change rotary motion into linear motion.
- To understand that different shapedcams produce different movements.
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