



# Mechanisms – Pop-up books



**Year: 5**  
**Term: Spring**

## Essential Prior Knowledge

*Children already know:*

How to use research and develop design criteria to inform the design of a functional, product that is fit for purpose.

How to generate, develop, model and communicate ideas for a mechanical design through discussion, annotated sketches and creating prototypes.

How to select from and use a range of tools and equipment to make a mechanism to cut, join and finish the product accurately.

How to select from and use construction materials to apply understanding of how to make a structure strong

How to use the mechanical system of a lever to make a mechanism move

**Evaluate**

## Key knowledge (facts and skills) for unit

### Technical and pre-design knowledge

**Sliders** – children to know that this is the part of a mechanism that allows it to move side to side (left to right)

**Lever** – children to know that this is a bar which moves around a pivot. Levers are used in many everyday products.

**Linkages** - children to know that these are a type of mechanism. For this design, they are the card strips (set of bars) joining one or more levers to produce the type of movement required.

**Input** – children to know that the input is the motion used to start a mechanism

**Output** – children to know that the output is what happens as a result of the mechanism working.

**Exploded diagram** – children to know that this is a diagram of a design that show all parts; both internal and external.

**Layers and spacers** – children to know that they can hide mechanisms and make them more 3D using paper-spacers, handmade zig-zags or thicker corrugated card.

### Design

- To know how to research and develop design criteria to inform the design of innovative, functional, appealing pop-up books that are fit for purpose, aimed at particular individuals or groups.
- To be able to generate, develop, model and communicate their ideas through discussion, annotated sketches and exploded diagrams of the interactive pop-up book design including the mechanism being used.

### Make

- To know how to apply understanding of how to strengthen, stiffen and reinforce the structures included in the interactive book.
- To know how to select from and use a wider range of tools and equipment to perform practical tasks e.g. cutting, shaping, joining and finishing, accurately.
- To know how to 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.
- To know how to include mechanical systems in their product design

### Evaluate

- To know how to investigate and analyse a range of existing interactive pop-up books to inform their design and create design criteria.
- To know how to evaluate their interactive books against their own design criteria and consider the views of others to improve their work.

## Key Outcomes

### **Can I explore pop-up structures and interactive mechanisms?**

Children will understand the design brief to 'Design and make your own interactive book using a mixture of pop-up structures and interactive mechanisms.' They will investigate examples of pop-up structures and mechanisms within a range of interactive greetings cards and storybooks. Children will decide on their intended audience (Year 1/2 children) and on a short story for the subject of their book and divide their chosen story into four key scenes. For example: Jack and Jill are walking up the hill (turn the lever clockwise to walk them up - the lever will swing on a pivot), Page 2: The pail of water comes out of the well (move the slider up and down), Page 3: Jill 'tumbles down' (move the lever anti clockwise on the pivot), Page 4: Jack sits up right (open the page to a right angle to make jack sit up right)

### **Can I produce and exploded diagram of my interactive book design?**

Children will create an annotated exploded diagram of their book design including where they intend the pieces for the mechanisms to go on each page following their success criteria (e.g. they may well have one structure popping up from the centre fold covering both pages, but can include other mechanisms elsewhere on the page)

### **Can I construct my interactive book?**

Children will create the structure of their book using equipment such as cardboard, scissors, rulers to carefully measure, fold, cut and join as appropriate. They will apply their understanding of how to strengthen, stiffen and reinforce their book structure.

### **Can I assemble my mechanisms?**

Children will- refer to their design diagrams and create the mechanisms and/or structures they want on each page labelling lightly in pencil where they want them to go. Children will 'dress-up' their books to hide mechanisms and make them more 3D using layers and spacers: paper-spacers, handmade zig-zags or thicker corrugated card. They will then ensure mechanisms; spacers and layers are operational before focusing on the storytelling elements. Some children may need templates or designs simplified.

### **Can I decorate and test my interactive book?**

Children will decorate their final product using their design and then test and alter as necessary ensuring that their mechanisms are functional and appealing for their intended audience.

### **Can I evaluate my design?**

Children will review each page against their original designs considering the following questions:

- Who has stuck to their plan and who has deviated? Why?
- Is their practical work better than their original designs? Why?
- Can they think of what they need to do to improve it next lesson?
- Have they produced the outputs they planned?

They will share their designs with the intended audience and take feedback from them on what is successful and what could be improved

## Assessing Pupils' Understanding and Progress

**Pupils with secure understanding indicated by:** Producing a suitable plan, naming each type of mechanism, input and output accurately. Producing the structure of the book and beginning to draw and assemble the components necessary for structures/mechanisms. Assembling the components for all structures/mechanisms and hiding the relevant parts of the mechanisms with more layers using spacers where needed. Add captions to their story and make it interactive for the users.

**Pupils working at greater depth indicated by:** Producing the above but to a higher level of sophistication, particularly with the use of more complex linkage systems. Using more demanding mechanisms/structures. Producing a product of exceptionally high quality – neatly and accurately cut and assembled. Assembling the components necessary for all their structures/mechanisms and hiding the relevant parts of the mechanisms with more layers using spacers where needed. Producing more demanding mechanisms/structures. Making is of exceptionally high quality (neatly and accurately cut and assembled). Including a wider range of more sophisticated mechanisms and structures. High quality making and sophistication of the surface decoration will be more demanding.

## Key vocabulary

- Pop-up structure
- Slider
- Lift-the-flap
- Rotate
- Spring
- Box fold
- Mouth fold
- Right angle
- Fixed pivot levers
- Loose pivot levers

