



Subject: DT

Year group: 3

Term: Spring

Unit name: Mechanical Systems – Levers and Linkages

- **Prior Knowledge** - • Children can design a product with a slider or lever and can explain the user and purpose. For example: a Christmas card with a moving character
- Children can draw an annotated sketch of their slider or lever product and can label it with materials and key parts (slider/lever, slit, split pin)
- Children can select from PVA glue, glue sticks and scissors to cut and join materials (card and paper).
- Children can name a variety of real-life items that use sliders and levers such as books, games (hungry hippos), seesaws at a park, brakes on a bike etc and can explain how the slider or lever creates movement.
- They understand the difference between sliders and levers.

National curriculum:

- To 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
- To generate, develop, model and communicate their ideas through discussion, annotated sketches and prototypes
- To select from and use a wider range of tools and equipment to perform practical tasks accurately
- To investigate and analyse a range of existing products
- To evaluate their ideas and products against their own design criteria and consider the views of others to improve their work

Key Vocabulary

Mechanism, lever, linkage, slot, guide, bridge, loose pivot, fixed pivot, input, output, oscillating, reciprocating, prototype, evaluation

Assessment for learning

Recapping prior knowledge- beginning of unit- what do children already know?

Beginning of each lesson- focus on recall of previous learning (quick quizzes)

Design Process

Investigative and Evaluative Activities (IEAs)

Focused Tasks (FTs)

Design, Make and Evaluate Assignment (DMEA)



**Enriching lives every day; enabling our school community to learn, achieve and flourish
through living 'life in all its fullness'**



End points (what pupils MUST know and remember)

- Children can design a mechanical system using more than one lever or linkage that is appealing and can explain the user and purpose. For example: a book
- Children can draw an annotated sketch of a mechanical system and can label it with materials and equipment.
- Children can make a prototype of levers and linkages using paper/card and can identify the input, output, fixed and moving parts.
- Children can select from PVA glue, glue sticks, paper clips, split pins and scissors to cut and join materials (card and cardboard).
- Children can name real items that use levers or linkages: windshield wiper, the bicycle suspension and hydraulic actuators for heavy equipment
- Children can state if their moving product is appealing and suitable for the intended user and purpose. They can listen to other' views and can offer a way to improve their product.
- Children can use levers and/or linkages in their product.

Years 3/4

Mechanisms
Levers and linkages

Instant CPD



Tips for teachers

- ✓ Give children the opportunity to make examples of lever and linkage mechanisms through focused tasks.
- ✓ Preparing a plentiful supply of card strips can be useful to speed up the process.
- ✓ Card from recycled packaging is a cost-efficient way of providing enough material for children to experiment with different arrangements and to make mock-ups and prototypes.
- ✓ When working with thin card, a hole can be made for the paper fastener pivot by pressing a pencil through the card on to a piece of Plasticine or Blu Tack.
- ✓ A picture can be drawn on and cut out from another piece of card and glued on to the output levers.
- ✓ Windows can be cut out of the backing sheet or extra pieces added so that the picture on the output lever is hidden and then revealed.
- ✓ The backing sheet can be shaped to suit the picture.
- ✓ Guides/bridges can be made using strips of card fixed with masking tape e.g. white card on diagrams.
- ✓ Display technical vocabulary and encourage the children to use it when discussing mechanisms and when designing and making.
- ✓ Make sure the existing books children investigate include moving pictures that are similar to the teaching aids.

Useful resources at www.data.org.uk:

- Levers and Linkages 'Let's Get Practical!' Support Pack
- D&T Primary 17 issue on mechanisms including levers and linkages
- CPD Resources Primary Inset Guides

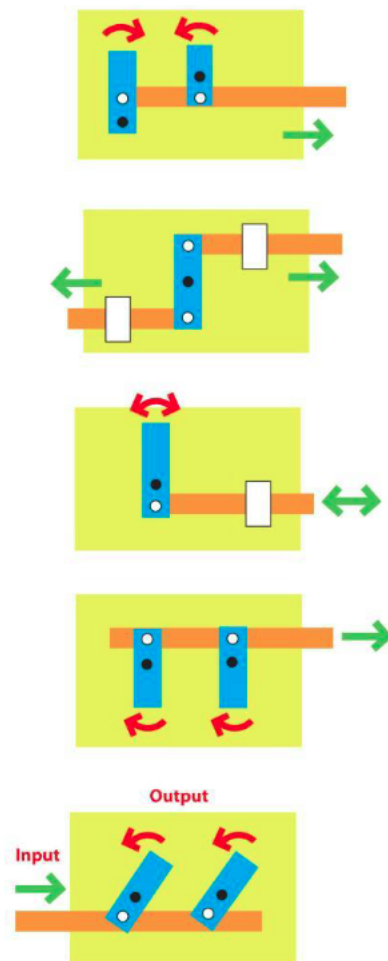
D&T Association publications:

- Primary Helpsheets - Unit 4B Storybooks
- Primary Lesson Plans - Unit 4B Storybooks

Please note that these publications are based on previous National Curricula.

Teaching aids to demonstrate levers and linkages

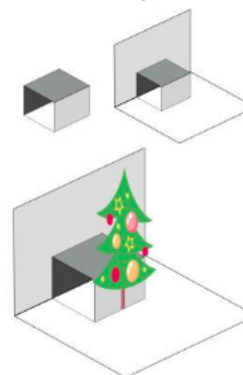
- Fixed pivot
- Loose pivot



When you push the card strip (input movement), the two levers move (output movement).

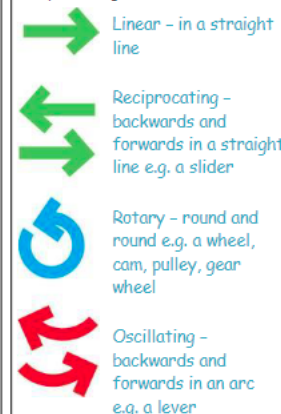
Pop-up mechanisms can be added to children's moving pictures as an enhancement. However, to build on work with simple levers and sliders in KS1, it is important to focus children's learning during this project on levers and linkages.

Making a pop-up from a small section of a recycled box:



1. Cut a slice off a small box.
2. Glue two sides to the paper.
3. Stick a picture to pop up on the front.

Lever and linkage mechanisms usually produce oscillating or reciprocating movement:



Designing, making and evaluating a greetings card with moving parts for family or friends

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process *might* be experienced by an individual pupil during this project:

THOUGHT	ACTION
What sort of greetings card shall I make and who will it be for? What part will move? How will it appeal to the user?	Discussing ideas, drawing annotated sketches, generating design criteria
How will it move?	Discussing ideas, modelling possible lever and linkage mechanisms
Which lever and linkage mechanism will work best for my greetings card?	Discussing and evaluating mock-ups and prototypes against design criteria
What media and materials will I use?	Discussing, exploring and trialling media and materials
Who will I work with? How long will it take? What order will I work in? What tools and techniques will I use?	Negotiating, developing and agreeing a plan of action
More thoughts ... appraising, reflecting, refining	More actions ... building, testing, modifying
Will the greetings card meet the needs of the user and achieve its purpose?	Evaluating the greetings card with the intended user and against design criteria

Glossary

- **Mechanism** - a device used to create movement in a product.
- **Lever** - a rigid bar which moves around a pivot. Levers are used in many everyday products. In this project children will use card strips for levers and paper fasteners for pivots.
- **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.
- **Loose pivot** - a paper fastener that joins card strips together.
- **Fixed pivot** - a paper fastener that joins card strips to the backing card.
- **System** - a set of related parts or components used to create an outcome. 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.