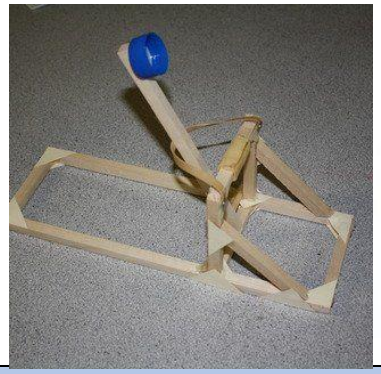
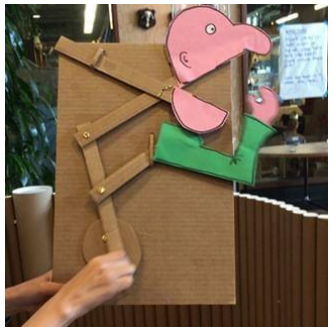
Lyppard Grange
DT Knowledge organiser

Year 3	Mechanical Systems- levers and linkages

Design, make and evaluate a _____ (product) for _____(user) for _____(purpose) – (to be completed by year group)

Examples of possible design and make tasks- catapults, trebuchet, shaduf, story book, information book, greetings card.



Key Knowledge

- Levers and linkages are devices that are used to create movement in a product.
- Distinguish between fixed and loose pivots.
- A paper faster that joins card strips together is a loose pivot.
- A paper faster that joins card to the backing card is a fixed pivot.
- 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.
- **Skills**
- Investigate books with linkage and lever mechanisms.
- Generate ideas and design criteria through discussion.
- Use sketches and prototypes to develop ideas.
- Order the stages of making.
- Select appropriate tools to cut, shape and join paper and card.

Vocabulary

Linkage- the card strips joining one or more levers to produce the movement required

Slot- the hole through which a lever is placed to enable part of the picture to move

Guide/ bridge- short card strip used to keep the lever and mechanisms in place

Levers, linkages, pivot, slot, bridge, guide, user, purpose, function, prototype, design criteria, design brief,

IEAs-

- Children investigate, analyse and evaluate books and, where available, other products which have a range of lever and linkage mechanisms.
- Use questions to develop children's understanding e.g. Who might it be for? What is its purpose? What do you think will move? How will you make it move? What part moved and how did it move? How do you think the mechanism works? What materials have been used? How effective do you think it is and why? What else could move?

Focused Tasks (FTs) -

- Demonstrate a range of lever and linkage mechanisms to the children using prepared teaching aids.
- Use questions to develop children's understanding e.g. Which card strip is the lever? Which card strip is acting as the linkage? Which part of the system is the input and which part the output? What does the type of movement remind you of? Which are the fixed pivots and which are the loose pivots?
- Demonstrate the correct and accurate use of measuring, marking out, cutting, joining and finishing skills and techniques.
- Children should develop their knowledge and skills by replicating one or more of the teaching aids.

Design, Make and Evaluate Assignment (DMEA)

• Develop a design brief with the children within a context which is authentic and meaningful.

• Discuss with children the purpose of the products they will be designing and making and who the products will be for. Ask the children to generate a range of ideas, encouraging creative responses. Agree on design criteria that can be used to guide the development and evaluation of the children's products.

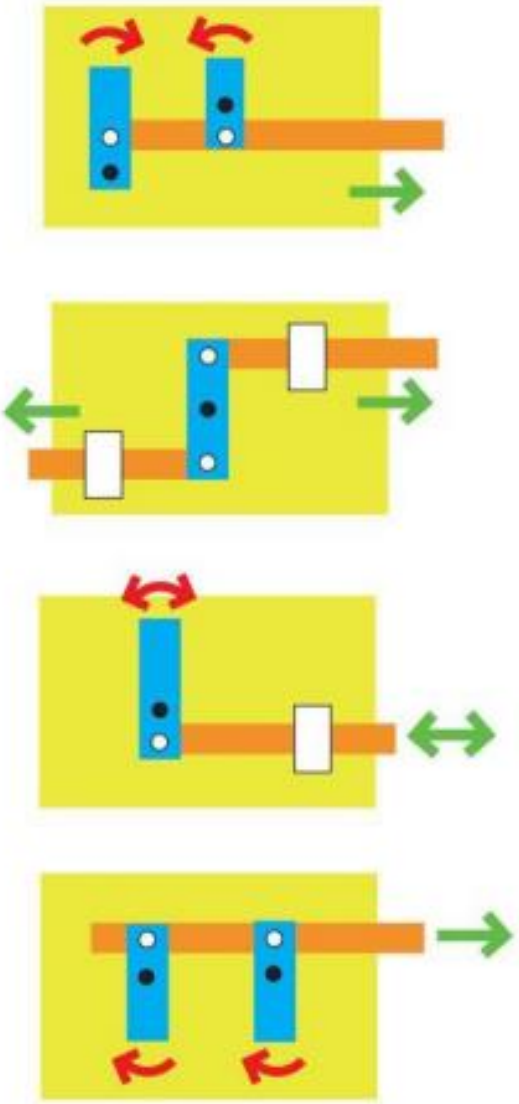
• Using annotated sketches and prototypes, ask the children to develop, model and communicate their ideas.

• Ask the children to consider the main stages in making before assembling high quality products, drawing on the knowledge, understanding and skills learnt through IEAs and FTs.

• Evaluate the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

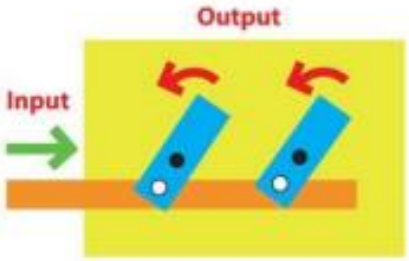
Teaching aids to demonstrate levers and linkages

- ● Fixed pivot
- ○ Loose pivot

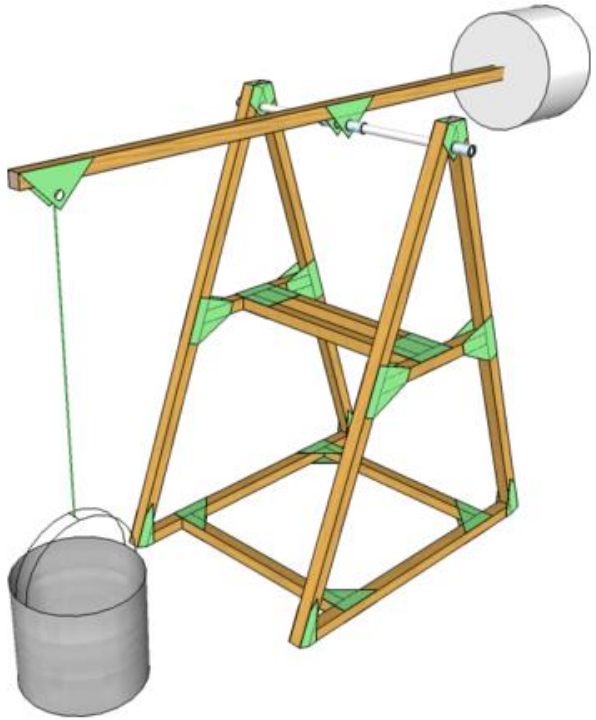


Lever and linkage mechanisms usually produce oscillating or reciprocating movement:

- Linear – in a straight line
- Reciprocating – backwards and forwards in a straight line e.g. a slider
- Rotary – round and round e.g. a wheel, cam, pulley, gear wheel
- Oscillating – backwards and forwards in an arc e.g. a lever



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



Top Tips-

- Give children the opportunity to make examples of lever and linkage mechanisms though 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.

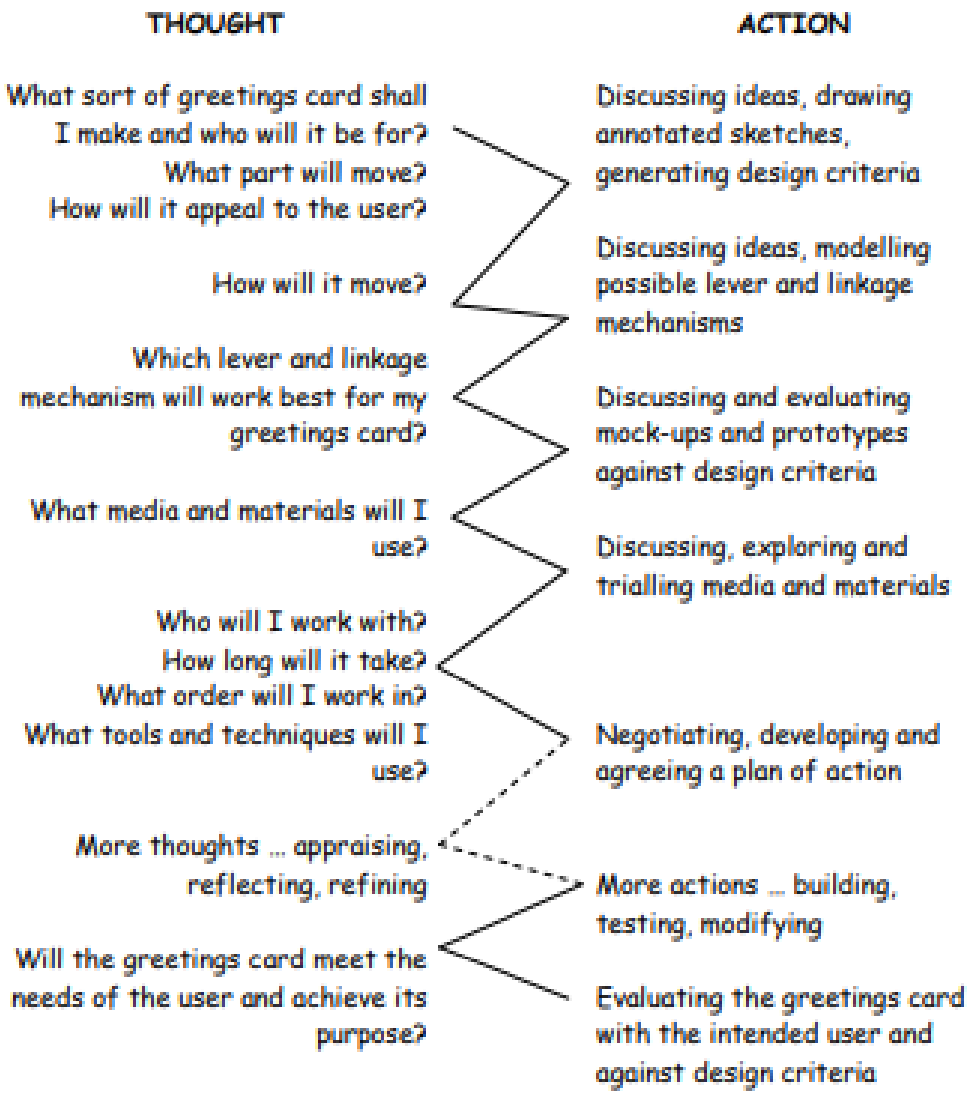
Health and safety-

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.

See risk assessments- saved in staff shard- Construction

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:



This follows on from-

Year 1- Mechanisms- sliders and levers- moving pictures

Key knowledge

- To understand that different mechanisms produce different types of movement
- To understand the steps to make a moving picture
- To make a design based on criteria e.g. the mechanism should work smoothly/ it should make the right type of movement
- To know how to evaluate my product and suggest improvements

Key skills

- To cut materials using scissors
- To join paper and card using glue, paper fasteners and masking tape
- Explore how moving objects work
- Explore books that use simple sliders and levers
- Generate ideas using design criteria, explaining what they could make
- To plan by suggesting what to do next
- To develop ideas using drawings and mock-ups using card and paper
- To make a product that uses a lever or hinge to make a movement

This leads onto- Year 5 Mechanical systems pulleys, gears or cams

Key knowledge

- Understand that mechanical systems have an input, process, and output and how pulleys can be used to speed up, slow down or change the direction of movement.
- To know that a frame structure can be reinforced and strengthened with triangular shapes at the corner.
- Know how to measure and cut different materials including dowel accurately and safely

Key skills

- Develop ideas through discussion, annotated drawings, exploded drawings and drawings from different views.
- Formulate step by step plans including lists of tools, equipment, and materials.