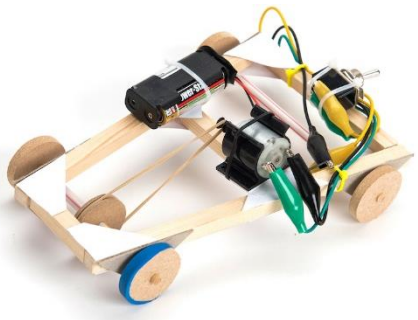
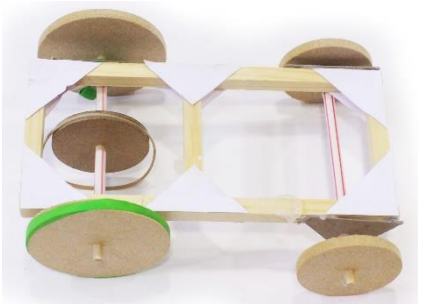
Lyppard Grange
DT Knowledge organiser

Year 5	Mechanisms- pulleys, gears and cams

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

Examples of possible design and make tasks- fairground ride e.g. carousel with gears/ pulleys. Controllable toy vehicle with gears or pulleys e.g. sports car, off road vehicle, moon buggy.





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 corners.
- Know how to measure and cut different materials including dowel accurately and safely.

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.
- Accurately measure lengths of wood, sawing and smoothing ends with sandpaper.
- Build a wooden pulley system.
- Create a chassis which will hold a motor.
- Attach a battery with wires to a motor.
- Evaluate the quality of the design throughout the process referring back to the design criteria.

Vocabulary

Pulley- a grooved wheel over which a belt can run.

Drive belt- the belt which connects and transfers movement between two pulleys.

mechanical system- a set of parts or components used to create movement.

axel, motor, circuit, switch, circuit diagram, exploded diagram.

Useful links-

KS2 Moving Vehicle - YouTube

KS2 make your own motorised vehicle (tts-group.co.uk)

IEAs-

- Investigate, analyse and evaluate existing everyday products and existing or pre-made toys that incorporate gear or pulley systems. Use videos and photographs of products that cannot be explored through first-hand experience.

- Use observational drawings and questions to develop understanding of each product in the collection 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, process and output 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?

Focused Tasks (FTs) – *link to computing- using crumble boards and motors*

- Investigate and explore various pulleys and/ or gears- (e.g. explore making pulleys using cotton reel, thread and pencil or elastic band, dowling and cotton reel)

• Build a working circuit that incorporates a battery, a motor and a handmade switch, such as a reversing switch. Demonstrate the accurate use of tools and equipment including cutting and stripping wire and making secure electrical connections. Remind children about the dangers of mains electricity. Draw a pictorial representation of the circuit or draw a circuit diagram using correct symbols.

• Develop measuring, marking, cutting, shaping and joining skills using junior hacksaws, G-clamps, bench hooks, square section wood and card triangles to construct wooden frames, as appropriate. Demonstrate the accurate use of tools and equipment.

Design, Make and Evaluate Assignment (DMEA)

• Develop an authentic and meaningful design brief with the children.

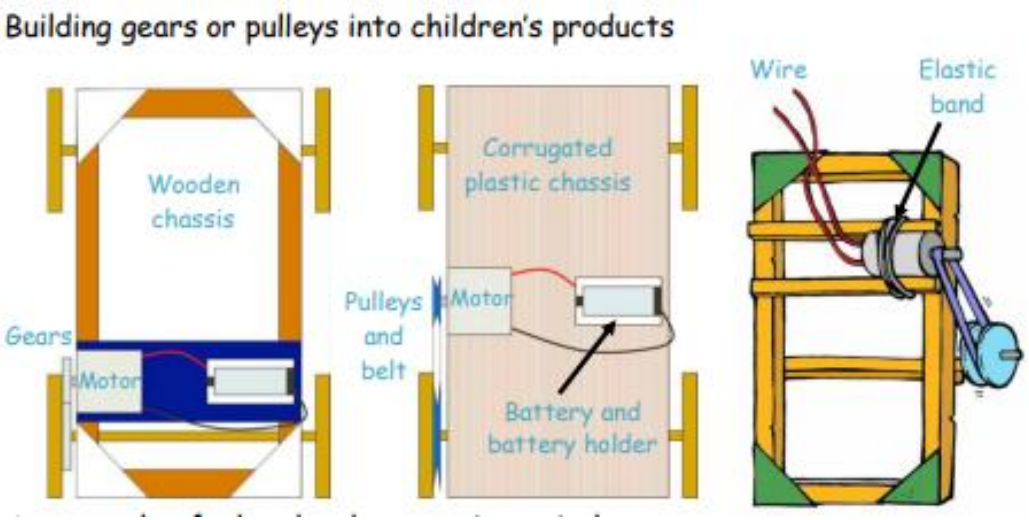
• Children generate innovative ideas by carrying out research including surveys, interviews and questionnaires and develop a design specification for their product, carefully considering the purpose and intended user for their product.

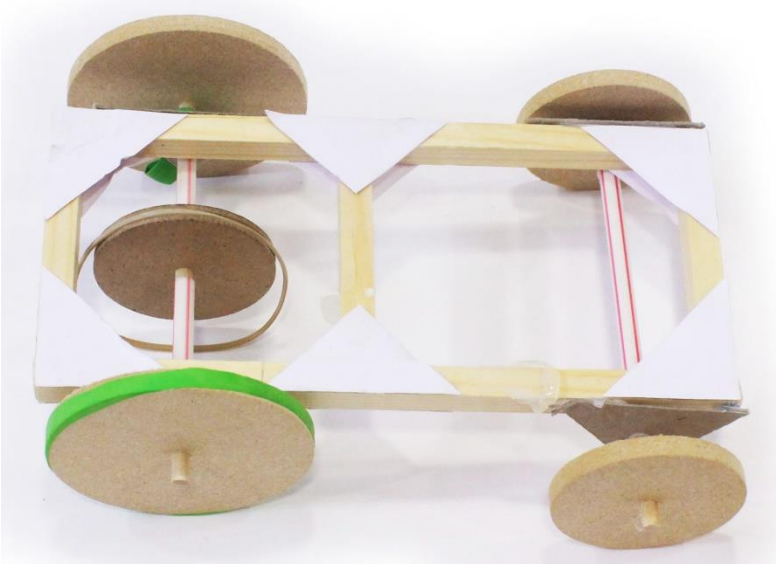
• Communicate ideas through detailed, annotated drawings from different views and/or exploded diagrams. The drawings should indicate the design decisions made, including the location of the mechanical and electrical components, how they work as a system with an input, process and output, and the appearance and finishing techniques for the product.

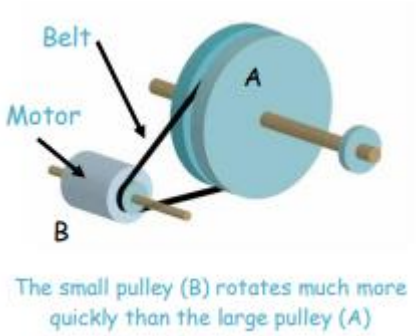
• Produce detailed step-by-step plans and lists of tools, equipment and materials needed. If appropriate allocate tasks within a team.

• 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.

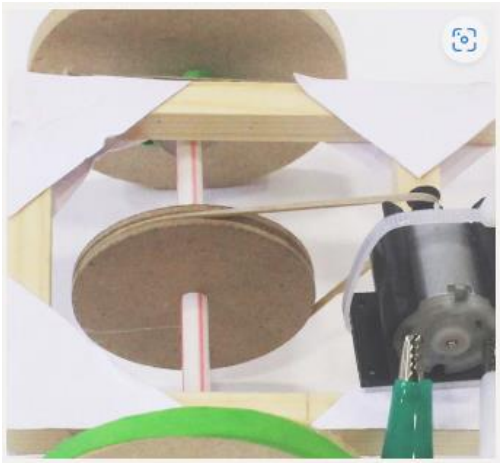
• Evaluate throughout and the final product in use, comparing it to the original design specification. Critically evaluate the quality of the design, the manufacture, functionality, innovation shown and fitness for the intended user and purpose







The small pulley (B) rotates much more quickly than the large pulley (A)



Top Tips-

- When beginning designing and making, ensure children are focused on making the mechanical system work, rather than the decoration.
- The key to success in these units is to use components that are compatible with each other e.g. components purchased should have the same diameter holes.
- When children are making, zone areas of the classroom so resources can be easily found and replaced independently.
- Include evaluations of why designs didn't work and how children would make them work. This links to design in the real world and the concept that designs don't always work first time around.

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.

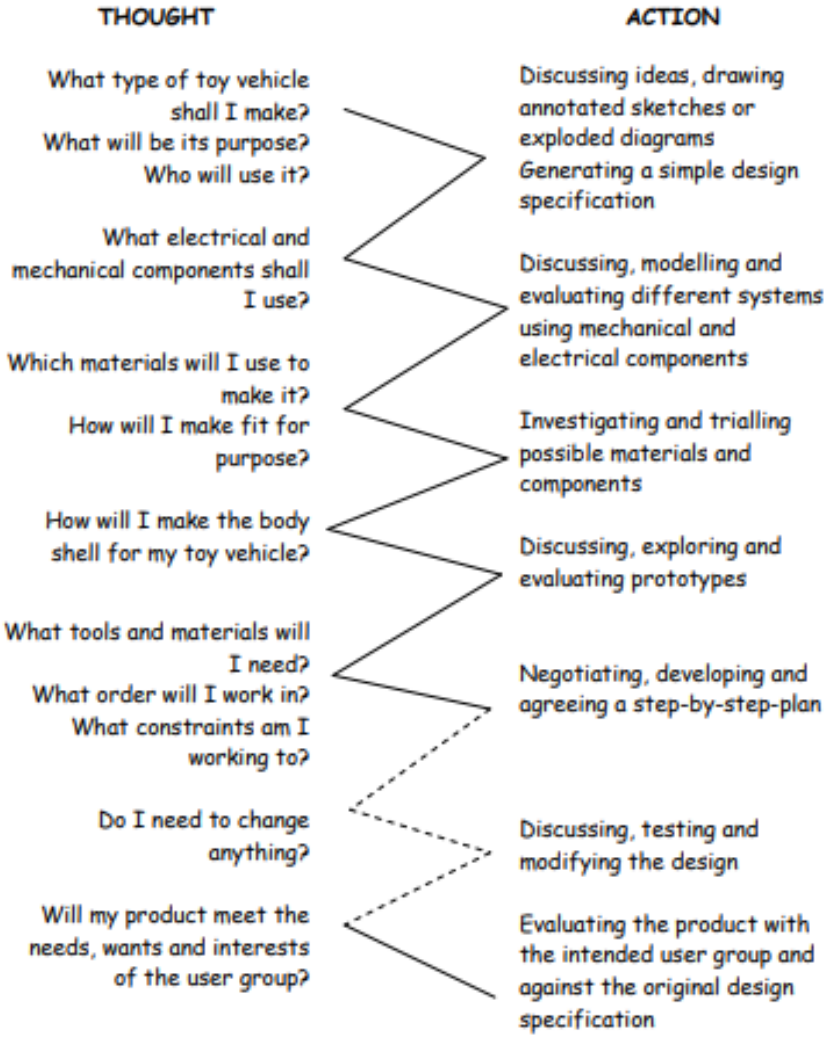
See risk assessments saved in staff shared.

Risk assessments- mechanics and construction.

Design and make task process- example

Designing, making and evaluating a new toy vehicle for children in a particular age range

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 2- wheels and axels

Key knowledge

- To know the difference between fixed and free moving axels

Key skills

- To explore how moving objects work
- To investigate wheels and axels and their strengths and weaknesses
- Attach wheels to a chassis using an axel
- Use a range of materials to create models with wheels and axels e.g. tubes, dowel, cotton reels

Year 3- levers and linkages

Key knowledge

- Levers and linkages are devices that are used to create movement in a product
- Distinguish between fixed and loose pivots
- 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.

Year 4- Electrical systems-

Simple circuits and switches (including programming and control)

Key knowledge

- To construct an electrical circuit using bulbs, switches and buzzers
- A System is a set of related parts or components used to create an outcome.
- To know how to make switches using various classroom materials e.g. card, foil, paper clips, paper fasteners
- Know how to find a fault in a simple circuit and correct it

Key skills

- To make a product that uses electrical components such as switches, bulbs or buzzers.
- Generate ideas through discussion, annotated sketches/ exploded diagrams.
- Order the stages of making.
- Select from and use tools and equipment to cut, shape, join and finish with some accuracy.
- Select the most appropriate techniques to make my product
- Evaluate products against design criteria, identifying strengths and areas for improvement
- To come up with solutions to problems as they happen

This leads onto- Year 6 - Electrical systems – including programming, control and monitoring

Key knowledge

- Understand and use electrical systems.
- Apply an understanding of computing to program, monitor and control.

Key skills

- Use research to develop a design specification.
- Communicate ideas through annotated sketches/ circuit diagrams.
- Formulate a step-by-step plan, listing tools, equipment, materials and components.

	• Select and assemble materials connecting electrical components to make a reliable, functional product. • Create and modify a computer control program to enable an electrical product to work automatically in response to the environment. • Continually evaluate and modify the working features of the product. • Test the system to demonstrate its effectiveness.