Medium Term Plan: Supporting Implementation of LTP/Progression Grid

Subject: DT - Mechanical systems – Pulleys and gears Unit 1/4 Year: A – Phase 3
NC/PoS:

- 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, exploded diagrams and prototypes.
- Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately.
- Select from and use a wider range of materials and components, including construction materials, according to their functional properties and aesthetic qualities.
- Investigate and analyse a range of existing products.
- Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work.
- To understand how key events and individuals in design and technology have helped shape the world
- To understand and use mechanical systems in their products.

Prior Learning (what pupils already know and can do)

- Know how to 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
- Know how to draw an annotated sketch of a mechanical system and can label it with materials and equipment.
- Know how to make a prototype of levers and linkages using paper/card and can identify the input, output, fixed and moving parts.
- Know how to select from PVA glue, glue sticks, paper clips, split pins and scissors to cut and join materials (card and cardboard).
- Know how to name real items that use levers or linkages: windshield wiper, the bicycle suspension and hydraulic actuators for heavy equipment
- Know 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.
- Know how to use levers and/or linkages in their product.

End points (what pupils MUST know and remember)

- Know how to design a mechanical system using pulleys and gears and can explain the user and purpose - a fairground ride for a child.
- Know how to draw annotated sketches and exploded diagrams of pulleys and gears and can show it from different angles.
- Know how to make a prototype of a pulley and a gear to show how they make different movements.
- Know how to select from PVA glue, glue sticks, glue guns and scissors to cut and join materials (wood, card and cardboard).
- Know how to name where gears and pulleys are used in real life – gears: non-digital clocks, vehicles, drills, manual can openers and bicycles. Pulleys: wells, elevators, construction vehicles.
- Know if their mechanical system is suitable for the intended user and purpose. They can offer a way to improve their mechanical system.

- Know how to use pulleys and gears and understand the differences in direction, speed and rotation.

Key Vocabulary
pulley, gear, direction, speed, rotation, evaluate

Recommended Resources:
- Real-life examples of gear and pulley systems (toys, bicycles, clocks, tools)
- Materials: card, wood, elastic bands, paper cups, string, dowels
- Tools: scissors, PVA glue, glue guns, rulers
- Annotated sketch and exploded diagram templates
- Videos or diagrams showing mechanical systems in action
- Research resources on Archimedes and modern mechanical systems

Curriculum Connections:

Science
- Forces and motion, simple machines, mechanical advantage

Maths
- Measurement, calculating speed/direction, scale and proportion in diagrams

History
- Archimedes and early engineering innovations

English
- Annotating, evaluating when providing feedback for each other's product, and presenting technical designs
- Explanations for how it met the design criteria

Art and Design
- Developing functional and appealing products, exploded diagrams

Personal development
- Resilience, self-reflection, innovation, listening to and using peer feedback
- Safety around moving parts (gears, cogs)

Computing (optional)
- Using digital tools to present exploded diagrams or design components

Career Opportunities:
- Mechanical Engineer
- Product Designer
- Automotive Engineer
- Toy Designer
- Theme Park Ride Engineer
- Inventor/Innovator

Session 1:
Evaluating existing products
- Explore a variety of images/objects that use gears or pulleys- what is the function of gears and pulleys in these mechanical systems? To make work easier e.g. gears: non-digital clocks, vehicles, drills, manual can openers and bicycles. Pulleys: wells, elevators, construction vehicles. Discuss similarities and differences between the two. Work out which mechanism each object uses and what the effect is? Which direction do they move?
- Learn about the inventor of pulleys – Archimedes. Pulleys date back at least to Archimedes (287 BC - 212 BC), the great Greek mathematician, physicist, and engineer. He designed a block-and-tackle system to move massive ships. Pulley Systems. Pulley systems allow us to lift a load by using a force that is less than the weight of the load.

Vocab: pulley, gear, direction, speed, rotation

Session 2:
Practising skills

- Experiment creating a pulley using simple designs e.g. A pulley system to move a marble in a plastic cup from one table to another.
- Experiment using and making gears, ensure measurements are accurate.

Vocab: pulley, gear

Session 3:
Designing

- Design: Can you design a product ensuring it includes pulleys or gears?
- Generate innovative ideas by carrying out research using web-based resources.
- Innovation: Have you considered how to make the project different and better than others of the same kind?
- Data: What does the research into existing products show is required for your product?
- Develop a simple design specification to guide their thinking, this should consider: Who is the intended user and what is the purpose of the mechanical system? What materials will you use? How will it be joined? How will it move, which direction, how fast/slow? How will it be finished? Which product will the mechanical system be part of? E.g. fairground ride.
- Present ideas through annotated sketches and exploded diagrams from different views.
- Produce detailed lists of tools, equipment and materials. Formulate step-by-step plans.
- Individual liberty – children are encouraged to make their products different and unique.

Vocab: pulley, gear, direction, speed, rotation

Session 4:
Making

- Select from and use a range of tools and equipment to make products that are accurately assembled and well finished: cardboard, elastic bands, paper, glue, scissors.
- Ensure the designs are followed and the design criteria is considered throughout.
- Test regularly to make any necessary changes are they go along.
- Ensure the product is finished to a high standard to make it appealing.
- Resilience – during the entire making process, we discuss keeping on trying and never giving up even if the task gets tricky.

Vocab: pulley, gear, direction, speed, rotation

Session 5:
Evaluating

- Compare the final product to the original design specification.
- Test products with intended user and critically evaluate the quality of the design, manufacture, functionality and fitness for purpose. Test to see if they move in the right direction and rotation? Do they move at the right speed? Could the intended user use the product effectively?
- Consider the views of others to improve their work. What do the other children in the class think? What does the intended user think?
- Evaluate: Did the product have an input, process and output? What are the areas of strength and improvement?
- Functionality: Does the product work for the intended purpose and compare well with the design specification? Is the product appealing to the eye?

- Honesty – during the evaluation stages discuss being honest with ourselves (self-reflection) and others to ensure we can improve ourselves and our work. Vocab: evaluate
Future learning this content supports: KS3 mechanisms work