

Year 3 Design and Technology: Mechanisms – Block C How can you do a lot of work with little effort?

- This block is set in the context of the CUSP Science unit 'Forces and magnets'.
- The outline and structure of the block is as follows:

	1				
Lesson 1	Lesson 2	Lesson 3	At	the end of this	block, pupils will
Exploring levers and their	Exploring linkages and	Making a linkages and		Know:	Be able to:
applications Developing practical skills	their applications Developing practical skills	levers product Evaluating outcomes	Туре Кеу	s of levers and linkages / terminology	Design and make simplistic lever and linkage products
	Developing design skills		rela	iting to levers nd linkages	Evaluate the success of their outcomes and
			Ho	w levers and	recommend



Archimedes (287BC - 212BC)

In this block, pupils will investigate various linkages and levers to design and make their own linkages and levers product. Pupils will select and use a variety of modelling materials to create their final outcomes.

CUSP Design & Technology Long term sequence	Block A	Block B	Block C	Block D	Block E	Block F
Year 1	Mechanisms	Structures	Food and Nutrition	Understanding Materials	Textiles	Food and Nutrition
Year 2	Textiles	Food and Nutrition	Mechanisms	Understanding Materials	Food and Nutrition	Structures
Year 3	Textiles	Food and Nutrition	Mechanisms	Food and Nutrition	Systems	Structures
Year 4	Food and Nutrition	Mechanisms	Textiles	Structures	Electrical Systems	Food and Nutrition
Year 5	Food and Nutrition	Systems	Textiles	Mechanisms	Structures	Food and Nutrition
Year 6	Food and Nutrition	Mechanisms	Food and Nutrition	Structures	Electrical Systems	Textiles



Intellectual content and design copyright © 2021 Unity Schools Partnership (Curriculum structure and principles © Greenfields Education Ltd) Image(s) used under license from Shutterstock.com

Point of reference: Y3 Mechanisms – Block C

Pupils will be able to:

their uses

Prior Learning

Design or Technology History:

· identify simple mechanisms and

The Greek mathematician Archimedes lived for 75 years, between 287BC – 212BC. He is considered one of the greatest mathematicians of all time and carried out extensive studies into the power of levers. He was so confident in his ideas that he once famously said, "Give me a place to stand on, and I will move the Earth."

Links to Literature:

Simple Machines: Forces in Action by Buffy Silverman (teacher resource) Levers by Martha E.H Rustad Making Machines with Levers by Chris Oxlade How Machines Work by Allan Sanders

Materials:

Flat strips of wood or man-made board, paper or plastic cups, bottle tops, lollipop sticks, elastic bands, marbles or weights, corrugated card, masking tape, double-sided tape, split pins, scissors, card (cereal boxes), paper, felt tip pens, double-sided tape, adhesive putty

Health and Safety:

This block requires pupils to use scissors, split pins and elastic bands to make quite large levers that could pose a risk of injury. Teachers should ensure that they follow their own school's risk assessments and policies for using the necessary materials and equipment. Pupils should be taught about how to use equipment and materials safely and responsibly as part of these lessons.

Working as a Designer					
Design	Make	Evaluate	Apply		
The art or process of deciding how something will look or work.	Create something by combining materials or putting parts together.	Form an opinion of the value or quality of something after careful thought.	Use something or make something work in a particular situation.		



Images of levers: Y3 Mechanisms – Block C





Point of explanation: Y3 Mechanisms – Block C

Core Knowledge	Explanation
lever	The lever is one of the most basic forms of a machine. A lever is a rigid body that has a fulcrum along its length. The fulcrum is the point where the lever pivots.
linkage	A mechanical linkage is a series of connected levers and pivots.
mechanism	A mechanism is a system of parts working together in a machine.

Technical Vocabulary	Definition
force	pushes or pulls, measured in Newtons
load	the weight of an object or objects being moved
effort	the force applied to make something move

Link to Video: https://vimeo.com/651091026/deb3323933

- Explanation and demonstration of taught content
- Lesson by lesson guidance
- Exemplification of techniques and outcomes



Point of delivery: Y3 Mechanisms – Block C

Revisiting prior learning	Taught content 😱	Point of practice	Point of reflection
1. Identify simple mechanisms and their uses	Learn how levers provide a mechanical advantage by creating a force that can move a load with minimal effort Identify the components of a lever: fulcrum, effort and load Identify the load, fulcrum and effort in three classes of lever Construct a class one and class three lever (see-saw and catapult) Evaluate outcomes and explore adaptations to increase the mechanical advantage	Introduce the key question for this unit: How can you do a lot of work with little effort? Also introduce the Knowledge Note. Show examples of levers and explain how these simple mechanisms provide a mechanical advantage. Show examples of different classes of lever, identifying the load, effort and fulcrum in each case. Ask pupils to identify the class of lever found in a range of everyday mechanisms. Demonstrate, using a class one lever (see-saw), how moving the fulcrum from the central point affects the amount of force required to move the load. In groups, pupils construct their own see-saw from cardboard. Teachers may choose to prepare templates or pre-cut sections for the construction of the fulcrum. Encourage pupils to explore the effects of moving the fulcrum to various positions along the lever, noting the force (number of marbles) required to move a given load each time. Demonstrate the construction of a catapult and explain its origins. Pupils construct their own catapults in pairs and evaluate the success of their construction. If time allows, challenge pupils to improve the mechanical advantage such as lengthening the lever or changing the size of the elastic band to create a larger force. Using photos, diagrams and annotations, pupils record what they have learned, their evaluations of their constructions and the results from their experiments.	Can identify the parts of a lever and explain how a lever works and how it provides a mechanical advantage Can identify different classes of lever and apply this knowledge to simple mechanisms Can construct simple mechanisms and explain the effects of making adaptations such as lengthening the lever or using a smaller elastic band
2. Levers create a force that can move a load with minimal effort A lever consists of: fulcrum, load and effort There are three classes of lever Simple mechanisms are those powered by hand	Linkages are a series of levers and pivots Explore the difference between the input and output force in a range of linkage systems Describe the different types of motion created by linkages Design a simple toy mechanism that uses a linkage system Explain how your toy will work and the movement created by the linkage	Use questioning to elicit pupils' recall and understanding of levers from the previous lesson. Introduce the concept of linkages, giving contextual examples. Explain that linkages are a series of levers and pivots and can be used to change the magnitude or direction of a force. Show an example of a simple linkage system and demonstrate the difference between the input and output force and identify fixed and loose pivots. Use a range of linkage systems to exemplify different types of motion: linear, rotary, reciprocating and oscillating. Demonstrate how to construct a linkage system from card (teachers may wish to provide pre-cut strips of card) and give pupils the opportunity to make different types of linkages. Use questioning and discussion to help pupils identify the types of movement involved, explore the effect of changing the position of pivots, and compare the input and output forces. Show examples of simple toys that contain linkages. Pupils then design their own, showing the linkage system they plan to use. Pupils record their designs in their portfolios, together with notes and examples of linkage systems. Finally, pupils complete Vocabulary Task 1.	Can explain the connection between levers and linkages Can describe the difference between the input force and movement and output force and movement Can begin to identify different types of movement created by linkages Can design a simple toy that uses a linkage mechanism, explaining how it will work and reasons for selecting a specific linkage



Point of delivery: Y3 Mechanisms – Block C

Revisiting prior learning	Taught content 😱	Point of practice	Point of reflection
3. Linkages are a series of levers and pivotsExplore the difference between the input and output force in a range of linkage systemsDescribe the different types of motion created by linkages	Select an appropriate design for a specific movement created by a linkage system Construct a simple linkage system Evaluate the outcome and suggest ways in which the movement of the mechanism could be changed or improved	Recap on the linkages explored in the previous lesson and make links with the key question for this unit: How can you do a lot of work with little effort? Show pupils again some examples of different linkages and, through discussion and questioning, establish that in all cases the input force or direction of movement is changed. Demonstrate how pushing the input rod a short distance can result in the output rod moving a further distance and, in some linkage systems, moving in a different direction. Remind pupils that this is what is called a mechanical advantage. Revisit the designs of novelty linkage toys created by the pupils in the previous lesson and ensure they have access to the materials needed to make their toys. Teachers may choose to provide templates and strips of card to support pupils with their construction. Encourage pupils to think carefully about the movement they wish to achieve, and whether they have selected the most appropriate linkage system. Prompt pupils to consider whether their design is appropriate for the type of motion they have planned and make changes to their design if necessary. Pupils complete Vocabulary Task 2 to evaluate the success of their completed toy and use photographs, diagrams and annotations to provide a record for their portfolio.	Can select a linkage system to create a desired movement Can select and create a design that complements the type of movement created Can use modelling skills to construct a simple linkage mechanism Can explain how their system works, the changes in movement and force achieved, and make suggestions for improvements





Oracy and Vocabulary: Y3 Mechanisms – Block C

Task 1: You have been investigating how mechanisms can allow us to do a lot of work with little effort. You have experimented with moving different weights using a class one lever. Order these words that describe weight, from lightest to heaviest.



Task 2: Work with a partner to evaluate your linkage toy by answering these questions.

Explain which linkage system you chose and why.	say say
Explain some of the decisions you made about your design and choice of toy.	ŢĴ
Are you satisfied with the movement you have created for your toy?	() () () () () () () () () (
What changes or improvements would you make to your toy?	(+)
 Write some instructions for how to make your toy. Explain any difficulties you faced and what you would do differently next time. 	



Vocabulary: Y3 Mechanisms – Block C

OWN-it	Analyse 🔊	KNOW-it	Define 👤
Underline the part of the word yo remove to change this adjective to	ou need to a noun.	Write the word that matches	this definition.
forceful		a push or a	pull
Underline the part of this word th <i>without.</i>	lat means	Explain the meaning of <i>input</i>	force.
effortless		The input force is	
Underline the part of this word th <i>machine</i> .	at means	Tick the correct definition of	a linkage.
mechanism		 the amount of force neede a rod that has a fulcrum a a series of connected levers 	d to move a load long its length s
LINK-it	Connect ๙	USE-it L	Jse in context 🔊
Write two words that begin with t			
	the root <i>mech</i> .	Use the phrase <i>fixed pivot</i> in	a sentence.
	the root <i>mech</i> .	Use the phrase fixed pivot in	a sentence.
Write a synonym for the word for	ce.	Use the phrase <i>fixed pivot</i> in 	a sentence.
Write a synonym for the word for	ce.	Use the phrase <i>fixed pivot</i> in Tick the sentence if the word used correctly. The truck dropped its <i>load</i> on accident.	a sentence.
Write a synonym for the word for Tick the word that does not mean load.	ce.	Use the phrase fixed pivot in Tick the sentence if the word used correctly. The truck dropped its load on accident. Write a sentence using the fo lever fulcrum	a sentence. load has been the motorway by ollowing words: effort
Write a synonym for the word for Tick the word that does not mean load. Weight	the same as	Use the phrase fixed pivot in Tick the sentence if the word used correctly. The truck dropped its load on accident. Write a sentence using the fo lever fulcrum	a sentence.



Intellectual content and design copyright © 2021 Unity Schools Partnership (Curriculum structure and principles © Greenfields Education Ltd) Image(s) used under license from Shutterstock.com

Knowledge Note: Y3 Mechanisms – Block C

Year 3: Mechanisms How can you do a lot of work with little effort?

Core content:

Investigate various linkages and levers. Design and make a linkages and levers product. Select and use a variety of modelling materials.

Technical vocabulary:

Lever — a rigid body that has a fulcrum along its length.

Load – the weight of an object or objects being moved.



Effort – the force applied to make something move.



Fulcrum – the point where a lever pivots.



Linkage – a series of connected levers and pivots.

Mechanism – a system of parts working together in a machine.



Force – pushes or pulls, measured in Newtons.

Connections:

Archimedes (287BC - 212BC)



Year 3: Mechanisms How can you do a lot of work with little effort?

Core content:

Investigate various linkages and levers. Design and make a linkages and levers product. Select and use a variety of modelling materials.

Technical vocabulary:

Lever – a rigid body that has a fulcrum along its length.

Load – the weight of an object or objects being moved.

Effort – the force applied to make something move.

Fulcrum – the point where a lever pivots.

Linkage – a series of connected levers and pivots.

Mechanism – a system of parts working together in a machine.

Force – pushes or pulls, measured in Newtons.

Connections:

Archimedes (287BC - 212BC)



€³€³





Intellectual content and design copyright © 2021 Unity Schools Partnership (Curriculum structure and principles © Greenfields Education Ltd) Image(s) used under license from Shutterstock.com

mechanical advantage of their catapult



How can you do a lot of work with little effort? Exemplification: Y3 Mechanisms – Block C





How can you do a lot of work with little effort? Exemplification: Y3 Mechanisms – Block C





Intellectual content and design copyright © 2021 Unity Schools Partnership (Curriculum structure and principles © Greenfields Education Ltd) Image(s) used under license from Shutterstock.com