ACET Junior Academies

Scheme of Work for Design Technology
Y3 Mechanical Systems – Levers and linkages

About this unit: In this unit pupils will learn about products with lever and linkage mechanisms. They will explore a range of books and other products with these mechanisms and will learn how the mechanisms work. Children will learn how to make a range of lever and linkage mechanisms and will develop an understanding of input, process and output. Children will design a moving product for an intended user and purpose. They will apply their learning from the unit to make their product and will evaluate their completed products, judging the extent to which they have met the original design criteria.
Final piece ideas: Moving pictures, moving picture books, moving information books/displays (Link to Geography 'Beneath My Feet' – Earthquakes/Volcanoes)
Possible inventor links: Archimedes (levers)

Unit structure

1. Investigate and Evaluate: What are levers and linkage mechanisms?
2. Focused Tasks: How can you make lever and linkage mechanisms?
3. Designing; What could I make and how will I make it? (May require two lessons)
4. Making – Planning and making: Can I make the product I designed?
5. Making – Finishing: How will I make my product appealing?
6. Evaluating: What went well? How could I improve my product?

Links to previous and future National Curriculum units

- KS1 – Mechanisms – Sliders and levers
- UKS2 – Mechanical systems – Pulleys and gears

<table>
<tr><th colspan="5">1: Investigate and Evaluate: What are lever and linkage mechanisms?</th></tr>
<tr><th>Links to previous learning</th><th>Knowledge and second order concepts</th><th>Skills, Concepts and Vocabulary:</th><th>Assessment criteria:</th><th>Curricular links:</th></tr>
<tr>
<td>Pupils will have previously explored and used mechanisms such as flaps, sliders and levers.
They will have gained experience of basic cutting, joining and finishing techniques with paper and card.</td>
<td>Substantive knowledge:
(What students should know.)
That there are a range of products with lever and linkage mechanisms that have been designed, produced and evaluated.
That lever and linkage mechanisms create movement.
Know how to use lever and linkage mechanisms.
That lever and linkage mechanisms can have different purposes.

Second order concepts:
(What students should understand)
Evaluation
Purpose
Function</td>
<td>Skills
• Begin to evaluate existing products, considering how well they have been made, the materials chosen, whether they work, how they have been made and if they are fit for purpose.
• Identify who designed a product and when it was made.
• Identify the materials products are made from.

Key vocabulary/concepts:
https://20353.stem.org.uk/Nuffield%20Glossary2/index.html

Evaluate, user, purpose, product, function, mechanism, lever, linkage, pivot, slot, bridge, guide</td>
<td>Can your children:
Explore a range of products which have a range of lever and linkage mechanisms.
Understand what products are and what their purpose is.
Identify who made the products and when they were made.
Explain how lever and linkage mechanisms work.
Identify the materials used products are made from and explain why materials have been chosen.
Express opinions about products based on design and use.</td>
<td>Horizontal:
Spoken language – participation in discussions and evaluation of products. Ask relevant questions to extend knowledge and build understanding. Build technical vocabulary.
Vertical:</td>
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<tr><th colspan="2">Suggested activities:</th><th>Resources:</th><th colspan="2">Useful links:</th></tr>
<tr>
<td colspan="2">Provide pupils with a range of books and other products which have a range of lever and linkage mechanisms to investigate and analyse including a sample of moving picture, lift up flap books.
Pupils could Archimedes – levers.
Use questions to develop the children's understanding of mechanisms and to introduce and develop technical vocabulary.
e.g. Who might it be for? What is its purpose? When was it made? What do you think will move? How will you make it move? What part moved and how did</td>
<td>Books and other products with lever and linkage mechanisms.</td>
<td colspan="2">http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf</td>
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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? Pupils complete an evaluation of a chosen product(s), using appropriate language to explain how a product moves.		

2: Focused Tasks: How do pictures and story books move?

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
Pupils will have evaluated and analysed products, identifying who made them, when they were made, the purpose of the product and the materials used to make it. Pupils will have explored a range of books and other products which have a range of lever and linkage mechanisms. They will have considered how the mechanisms work.	**Substantive knowledge:** *(What students should know.)* Develop and use knowledge of how to construct lever and linkage mechanisms. That lever and linkage mechanisms have an input and an output Know and use technical vocabulary relevant to the project. **Second order concepts:** *(What students should understand)* Input Output Process	**Skills** • Begin to understand how learning from Science and maths can be used to help design and make products that work • that mechanical and electrical systems have an input, process and output • Know how mechanical systems such as levers and linkages or pneumatic systems create movement • Work safely, hygienically and accurately with a range of simple tools. • Measure, mark out, cut and shape materials and components with some accuracy • Assemble, join and combine materials and components with some accuracy • the correct technical vocabulary for the projects they are undertaking •	**Can your children:** Explain how lever and linkage mechanisms work. Use resources to replicate lever and linkage mechanisms.	**Horizontal:** Maths – vocabulary of position, direction and movement. Using rulers to measure to the nearest cm/half cm or mm. Spoken language – ask relevant questions to extend knowledge and build understanding. Build technical vocabulary. Art and design – use colour, line pattern and shape. **Vertical:**

		Key vocabulary/concepts: mechanism, lever, linkage, pivot, slot, bridge, guide, linear, rotary, oscillating, reciprocating, system, input, process, output		
Suggested activities:		**Resources:**	**Useful links:**	
Demonstrate a range of simple lever and linkage mechanisms to pupils. Use questions to develop the children's understanding and encourage accurate use of technical vocabulary 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?* Model the correct and accurate use of measuring, marking out, cutting, joining and finishing skills and techniques. Pupils choose and use tools and materials to replicate the lever and linkage mechanisms.		Prepared lever and linkage mechanisms Card, paper, masking tape, paper fasteners, paper binders, glue, scissors, finishing materials	https://www.youtube.com/watch?v=YlYEi0PgG1g https://www.bbc.co.uk/bitesize/clips/zrp6n39 http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf	
3: Designing: What can I create and how will I make it?				
Links to previous learning	**Knowledge and second order concepts**	**Skills, Concepts and Vocabulary:**	**Assessment criteria:**	**Curricular links:**
Children will be able to talk about lever and linkage mechanism and how they work. They will have use resources to create lever and linkage mechanisms.	**Substantive knowledge:** *(What students should know.)* That products need to be designed before they are made. That designers consider the needs and wants of a user. That products are according to design criteria. That a design brief outlines the aims of a design that is needed. That design criteria are the standards the finished product must meet. That a design proposal is a response to a design brief That the order of making needs to be planned	**Skills** • Begin to describe the purpose of their product • Explain how particular parts of their product work • Consider the needs and wants the user • Develop their own design criteria and use to inform their ideas • Through discussion, generate realistic ideas for an item,	**Can your children:** Develop ideas about the product they are going to make based on the needs of the user. Create annotated sketches and prototypes to communicate ideas. Select appropriate tools, materials and techniques for the task. Choose a mechanism for their product and	**Horizontal:** Spoken language - ask relevant questions to extend knowledge and build understanding. Build technical vocabulary. Art and Design – use and develop drawing techniques. Se colour, pattern, line and shape. History – Stone Age

	Second order concepts: *(What students should understand)* Design brief Design criteria Design proposal	considering its purpose and the needs of the user/s • Model ideas through the use of prototypes. • Communicate ideas through producing drawings with labels • Select from a range of tools and materials • Order the main stages of making **Key vocabulary/concepts:** Intended user, purpose, design criteria, prototype, mechanism, lever, linkage, pivot, slot, bridge, guide, linear, rotary, oscillating, reciprocating	explain their choices? Order the main stages of making?	**Vertical:**
Suggested activities:		**Resources:**	**Useful links:**	
Set a context which is authentic and meaningful and share a design brief for the product they will make e.g.- moving story, book, poster, class display, information book/poster about Earthquakes or Volcanoes. Discuss with pupils the purpose of the products they will be designing and making and who the products will be for. Ask pupils 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 e.g. the mechanism should move smoothly. Following discussion to develop ideas, pupils produce labelled drawings and prototypes to model and communicate their ideas. Pupils consider e.g. *What will you need to include in your design? How can you improve it? What materials will you use? How will you make sure your product works well and has the right appearance?* Pupils complete a design proposal, detailing the tools, equipment and materials they will use and the order in which they will make the product through. This could be done through flow charts or storyboards or through writing a list of instructions.		Materials and tools for making prototypes	**Plan Bee has paid resources on how to make moving/pop up story books.** **https://www.planbee.com/storybooks-the-complete-series** http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf	

4: Making: Can I produce the product I designed?				
Links to previous learning	**Knowledge and second order concepts**	**Skills, Concepts and Vocabulary:**	**Assessment criteria:**	**Curricular links:**
Children will have identified the product they are going to make. They will be able to talk about the purpose, intended user and the materials from which it will be built. Pupils will be aware of design criteria and will know the order in which they will make their product.	**Substantive knowledge:** *(What students should know.)* That design proposals and criteria are used to guide the making process. The importance of evaluating ongoing work. **Second order concepts:** *(What students should understand)* Functionality Aesthetics Evaluate	**Skills** • Select tools and equipment for a task, explaining their choices in relation to the skills and techniques they will be using • Select materials and components, explaining their choices in relation to functional properties and aesthetic qualities • Use a wider range of materials and components • Follow procedures for safety and hygiene • Measure, mark out, cut and shape materials and	**Can your children:** Consider the order they will complete their task? Choose suitable materials and tools to complete their task? Evaluate their developing products and use problem solving skills when things go wrong?	**Horizontal:** History – Stone Age Spoken Language – Understand and use technical language Maths – accurately measure to nearest cm, half cm or mm **Vertical:**

		components with some accuracy • Assemble, joins and combine materials and components with some accuracy • **Key vocabulary/concepts:** Intended user, purpose, design criteria, mechanism, lever, linkage, pivot, slot, bridge, guide, linear, rotary, oscillating, reciprocating		
Suggested activities:		**Resources:**	**Useful links:**	
Remind pupils of the design brief and give them opportunity to revisit their design proposals and plans. Pupils recall the appropriate tools required and skills learned in previous lessons. Pupils collect the materials and tools required for their product and apply the knowledge, skills and techniques learned from previous lessons. Encourage the children to evaluate their developing products by referring to the design criteria, considering the intended purpose and user e.g. *Does your lever move smoothly? Is your object moving in the way you intended?* Encourage pupils to identify why things have gone wrong and use their knowledge and skills to solve problems e.g. *Why is it moving in the wrong direction? Why is the mechanism not smooth? How can you fix that?* Pupils could record changes made to overcome problems or any improvements made on their plans.		Range of card, masking tape, paper fasteners, glue stick, PVA glue, scissors	http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf	
5: Finishing: How will I make my product appealing?				
Links to previous learning	**Knowledge and second order concepts**	**Skills, Concepts and Vocabulary:**	**Assessment criteria:**	**Curricular links:**

Pupils will have used their understanding of levers and linkages to create a product. They will have evaluated their evolving products against their design criteria and used knowledge and skills to identify and overcome problems.	**Substantive knowledge:** *(What students should know.)* That products need to be finished to a high quality to make them appealing to the intended user. Know a range of techniques suitable for the product they are creating. The importance of evaluating evolving work. **Second order concepts:** *(What students should understand)* Finish Appeal	**Skills** • Use finishing techniques to strengthen and improve the appearance of their product with some accuracy. **Key vocabulary/concepts:** Design brief, design criteria, Finish/finishing techniques, appearance, appealing, innovative,	**Can your children:** Apply a range of finishing techniques suitable for the product they are making? Evaluate their developing products and use problem solving skills when thigs go wrong?	**Horizontal:** Art and design – Use colour, pattern, line and shape to finish products Spoken Language – Understand and use technical vocabulary **Vertical:**

Suggested activities:	**Resources:**	**Useful links:**
Refer to design brief and proposals. Pupils use finishing techniques to complete their products, referring to the design brief and their design proposals. Pupils continue to evaluate their work e.g. Which finishing technique are you using? Why are you choosing this technique? How does your chosen finish meet the needs of the intended user?	Finishing resources, e.g. pens, pencils, paint, computing software, collage materials	http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf

6: Evaluating: Next time I will…?

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
Children will have generated and developed ideas for their product. They will have explored different lever and linkage mechanisms and designed a product with an intended purpose for an intended user. They will have chosen	**Substantive knowledge:** *(What students should know.)* That evaluations identify the strengths and areas for development in a product. That products change and evolve through evaluations. **Second order concepts:** *(What students should understand)* Evaluate Develop	**Skills** • Begin to use their design criteria to evaluate their product identifying both strengths and areas for development • Consider how their product can be improved .**Key vocabulary/concepts:** Evaluate, design criteria, design brief, innovative, user, purpose,	**Can your children:** Use their design criteria valuate their product be judging the extent to which it suits the purpose and meets the neds of the intended user. Identify both the strengths of the product and the areas for development?	**Horizontal:** Spoken Language – Ask relevant questions to extend knowledge and understanding. Answer questions giving clear explanations **Vertical:**

techniques to make and finish their product. They will have evaluated their evolving work and overcome problems using problems solving skills.		function, product, ideas, appeal, finish, improve		
Suggested activities:		**Resources:**	**Useful links:**	
Pupils evaluate their final products against the design criteria. They consider the extent to which the product meets the neds of the intended user and suits the intended purpose. Where possible allow feedback from the intended user. *Does the product suit the purpose? Does it suit the intended user? Does the mechanism work smoothly? Is it the right kind of movement? How well has the product been finished? Are the materials suitable for the product? How could the product be made* more appealing? Pupils complete an evaluation for their own product.		Completed products Evaluation sheets	http://www.mrjennings.co.uk/teacher/DT/D&T%20Lower%20KS2%20project%20sheets.pdf	