ACET Junior Academies

Scheme of Work for Design Technology

Y2 Mechanisms – Wheels and Axles

About this unit: In this unit, pupils will explore a range of toys with wheels. They will learn about wheels and axles and they can be assembled as free or fixed axles. Pupils will explore making vehicles with free or fixed axles using construction kits and a range of new and reclaimed materials. Pupils will design a wheeled product for a particular user and purpose and will use their knowledge and skills to make the product before evaluating it against the original design criteria.
Final piece ideas: toy vehicles, vehicles relating to significant events/individuals in history, e.g. travel and transport, Isombard Kingdon Brunnell – Shipbuilder, George Stephenson – The Rocket

Unit structure

1. Investigate and Evaluate – What moves and how does it move?
2. Focused Tasks – How are wheels and axles put together?
3. Designing – What could I make?
4. Making – Can I make the product I designed?
5. Making – Can I improve the appearance of my product?
6. Evaluating – How did I do?

Links to previous and future National Curriculum units

- EYFS – experience of playing with wheeled vehicles and using construction kits to build wheeled vehicles.
- UKS2 – Mechanisms – Pulleys and Gears

<table>
<tr><th colspan="5">1: Investigate and Evaluate: What moves and how does it move?</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>Children will have assembled vehicles with moving wheels using construction kits. They will have explored vehicles through play. Children will have gained some experience of designing, making and evaluating products for a specified user and purpose. They will have developed some cutting , joining and finishing skills with card.</td>
<td>Knowledge:
Substantive knowledge:
(What students should know.)
Understand that products have been designed and produced.
That there are a range of wheeled products made for different users and for different purposes.
That products can be made from different materials.
That materials are selected based on their properties.

Second order concepts:
(What students should understand)
Evaluation
User
Purpose
Properties</td>
<td>Skills
• Understand what a product is and who it is for
• Understand how a product works and how it is used
• Understand how a product works
• Identify where you might find this product
• Identify the materials used to make the product and suggest why they were chosen.
• Express an opinion about the product

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

evaluate, user, purpose, product, function, appearance, appealing, materials, vehicle, wheel, axle, axle holder, chassis, body, cab</td>
<td>Can your children:
Explore a range of products which have wheels.
Understand what products are, who they are for and how they are used. Explain how wheeled products work.
Identify the materials used in the products.
Say what they like or dislike about the products.</td>
<td>Horizontal:
Science – ask simple questions and observe closely. Explore the use of everyday materials.
Spoken language – Use of technical vocabulary. Ask relevant questions to extend understanding and build vocabulary and knowledge.

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">Pupils could explore and investigate a range of wheeled products such as toys and everyday objects. Pupils could also walk around the local area to identify wheels in the environment. Develop understanding through questions - What is</td><td>Range of wheeled products, including toys and everyday products</td><td colspan="2">https://www.youtube.com/watch?v=AHGQCLRLlUU&feature=emb_logo</td></tr>
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it? What is it for? How is it used? Who is it for? How does it work? Where might you find it? What is it made from? What do you think about it? Encourage the children to look closely at the product e.g. the number, size, position of wheels, and methods of fixing wheels and axles e.g. *How do you think the wheels move? How do you think the wheels are fixed on? Why do you think the product has this number of wheels? Why do you think the wheels are round?* Develop the children's vocabulary, introducing key vocabulary body, chassis, wheels, axle, axle holders. Pupils could choose an example of a wheeled product to draw/photograph and evaluate, stating the user, purpose and materials made from and labelling the main parts e.g. body, chassis, cab, wheels, axles and axle holders.		https://www.youtube.com/watch?v=XzG1aPw7YBc&feature=emb_logo https://education.theiet.org/primary/teaching-resources/wheels-and-axles/

2: Focused Tasks – How are wheels and axles put together?

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
Pupils will have explored and evaluated a range of wheeled products, including toys and everyday objects. They will be able to talk about the purpose of wheeled products and identify intended users. Pupils will be able to identify some of the materials products are made from and some will be able to explain why these materials might have been chosen.	**Substantive knowledge:** *(What students should know.)* How to assemble wheels and axles. That wheels and axles can be assembled to make a fixed or free axle. Know and use technical vocabulary relevant to the project. **Second order concepts:** *(What students should understand)* Free Fixed	**Skills** • Know about and discuss the simple working characteristics of materials and components • Know about the movement of simple mechanisms such as wheels and axles • Know and use the correct technical vocabulary for the project • **Key Vocabulary/concepts:** Vehicle, wheel, axle, axle holder, chassis, body, cab, fixed, free, moving, mechanism	**Can your children:** Understand and explain the movement of wheels and axles. Combine wheels, axles and axle holders to create examples of fixed and free axles. Evaluate the advantages and disadvantages of fixed and free axles.	**Horizontal:** Spoken language – Listening to and following instructions. Build technical vocabulary. **Vertical:**
Suggested activities:		**Resources:**	**Useful links:**	

Children explore making wheeled vehicles using construction kits. Use materials to model to children how wheels and axles can be assembled as either fixed axles or free axles and show different ways of making axle holders. Model the correct use of tools, equipment and techniques to make a simple vehicle. This could be done in a step-by-step way with a flow chart or story board to aid children in their own work. Children choose from and use samples of materials and components to create their own examples of simple vehicles with fixed and free axles. Encourage children to talk about the advantages and disadvantages of each.	Construction kits containing wheels and axles, resources for making wheels, axles and axle holders e.g. cardboard, cotton reals, dowel, clothes pegs, straws, card discs, MDF wheels	

3: Designing – What could I make?				
Links to previous learning	**Knowledge and second order concepts**	**Skills, Concepts and Vocabulary:**	**Assessment criteria:**	**Curricular links:**
Children will have experienced using construction kits and new and reclaimed materials to make and combine wheels, axles and axle holders to produce examples of fixed and free axles. They will have evaluated fixed and free axles and will have considered the advantages and disadvantages of both.	**Substantive knowledge:** *(What students should know.)* That products need to be designed before they are made. That designs should always meet the needs of the user and purpose. That design ideas can be communicated in different ways. **Second order concepts:** *(What students should understand)* Design User Purpose Criteria	**Skills** • Explain what product they will be designing and making • Explain who their product will be used by • Describe what their product will be used for and how it will work • Explain why their product is suitable for the intended user • Develop and use simple design criteria to develop ideas **Key Vocabulary/concepts:** Design, make, user, purpose, ideas, design criteria, product, function, fixed/free axle	**Can your children:** Talk about what they are going to design and make and who the intended user will be. Describe how they will make their product, including the materials they will use and how they will make it move. Communicate their ideas through discussion, mock-ups and design plans.	**Horizontal:** History – vehicles linked to significant individuals/events Events within living memory – Toys, Science – use of everyday materials. **Vertical:**
Suggested activities:		**Resources:**	**Useful links:**	
Discuss with children what they will be designing, making and evaluating within an authentic context e.g. toy wheeled vehicles, vehicles relating to significant		Materials to make mock-ups of designs,		

events/people in history e.g. George Stephenson's Rocket, Isombard Kingdom Brunel - Shipbuilder, first aeroplane, first motor car etc. With the children identify a user and purpose for the product and generate simple design criteria, e.g. the axles must run freely within the holders, the wheels must attach firmly to the axle/the axle must fit firmly into the axle holder, the wheels must run freely on the axles. Encourage the children to develop their ideas through discussion, drawings and mock-ups. Children choose one idea to follow through and create a design plan detailing the materials to be used and the axle type chosen. Discuss with the children the stages in making their products and plan the order, e.g. prepare the body, add/create the axle holder, add axles, add wheels, test and finish – create a flow chart or story board that children could refer to to support them in their making.	Planning sheet	

4: Making – Can I make 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 their product needs to be made in a particular order. Know the materials, tools and equipment suitable for the task. Know the skills and techniques they are going to use to make their product. **Second order concepts:** *(What students should understand)* Evaluate Movement Problem solving	**Skills** • Choose and use suitable tools for making and explain why they should be used • Choose materials and components to use based on suitability of their properties and explain their choices • Follow safety and food hygiene procedures • Measure, mark out, cut and shape materials and components using appropriate tools, equipment and techniques. • Join, assemble and combine materials and components •	**Can your children:** Talk about the steps thy will take to make their product. Choose tools, techniques and materials that are suitable for the task. Use problem solving skills when things go wrong. *Y2 Explain choices made*	**Horizontal:** Maths – use appropriate standard and non-standard measures Science – properties and use of everyday materials. **Vertical:**

		Key Vocabulary/concepts: Design criteria, design plan, wheel, axle, fixed axle, free axle, axle holder, chassis, cab, body,		
Suggested activities:		**Resources:**	**Useful links:**	
Give pupils the opportunity to revisit their design plans and recap the order in which the products will be made. Pupils collect the materials and tools required for their product and use their design plan and design criteria as an ongoing guide. Encourage the children to evaluate their developing products by referring to the design criteria – *Does your axle move freely/is it fixed firmly in the axle holder? Do your wheels move freely/are they fixed firmly on the axle?* Encourage children to problem solve when things go wrong –*How can you make your wheels move more freely? What could you do to solve that problem?*		Construction kits, card, cardboard boxes, cotton reals, dowel, clothes pegs, straws, card discs, MDF wheels, scissors, masking tape, PVA glue,		
5: Finishing – Can I improve the appearance of the product I have made?				
Links to previous learning	**Knowledge and second order concepts**	**Skills, Concepts and Vocabulary:**	**Assessment criteria:**	**Curricular links:**

Pupils will have chosen materials and tools to make their wheeled products. They will have made a choice of they kind of axle they will use. Pupils will have used their design plans and design criteria to support their work and will have evaluated their ongoing work, making changes where necessary. Most pupils will have completed the 'make' of their product.	**Substantive knowledge:** *(What students should know.)* That products need to be finished well to make them appealing to the user. Know a range of finishing techniques suitable for the product, including skills used in Art and Design. **Second order concepts:** *(What students should understand)* Evaluate Finish Appearance Appeal	**Skills** • Use a range of simple finishing techniques including skills learnt in Art **Key Vocabulary/concepts:** Finish/finishing, appearance, appealing	**Can your children:** Use 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 a range of media and materials creatively to design and make products. **Vertical:**
Suggested activities:		**Resources:**	**Useful links:**	
Children should consider the finish of their product not it is complete. Return to plans and review original ideas making changes where necessary. *How are you going to make your products appealing? What finishing techniques do you plan to use.* Children finish their products with their choice of technique.		Finishing resources, e.g. pens, pencils, paint, computing software, collage materials		
6: Evaluating				
Links to previous learning	**Knowledge and second order concepts**	**Skills, Concepts and Vocabulary:**	**Assessment criteria:**	**Curricular links:**

Pupils will have made and finished their wheeled products. They will have made choices regarding the tools, materials and finishing techniques. Pupils will have experienced evaluating their ongoing work, making changes where necessary.	**Substantive knowledge:** *(What students should know.)* That all new products are evaluated. That evaluations help products to develop. To evaluate their product by discussing how well it works in relation to the purpose and the intended user. To evaluate whether the product meets the design criteria. **Second order concepts:** *(What students should understand)* Evaluate Improve Develop	**Skills** • Talk about their design ideas and what they have made • Make simple judgements of how the product met their design ideas and design criteria • Suggest how their products could be improved **Key Vocabulary/concepts:** Evaluate, design criteria, user, purpose, function, product, ideas, appeal, finish, improve	**Can your children:** Talk about their product and their design ideas. Judge their product against the original design criteria. Identify area that could be improved and make suggestions of changes that could be made.	**Horizontal:** English – Speaking and Listening – participate in discussion, ask relevant questions **Vertical:**
Suggested activities:		**Resources:**	**Useful links:**	
Pupils engage in discussions about their own and other pupils' work. Develop evaluation through asking questions e.g. *Does the product suit the purpose? Does it suit the intended user? Does the product move freely? How freely does the axle/do the wheels move? How well has the product been finished? Are the materials suitable for the product? How could the movement be made smoother? How could the product be made more appealing?* Pupils complete an evaluation for their own product.		Completed products Evaluation sheet		