

Year Groups

Year 1/2

Mechanisms

Wheels and axles

Health and safety

Pupils should be taught to work safely, using tools, equipment, materials, components and techniques appropriate to the task.

Key learning in design and technology

Prior learning

- Assembled vehicles with moving wheels using construction kits.
- Explored moving vehicles through play.
- Gained some experience of designing, making and evaluating products for a specified user and purpose.
- Developed some cutting, joining and finishing skills with card.

Designing

- Generate initial ideas and simple design criteria through talking and using own experiences.
- Develop and communicate ideas through drawings and mock-ups.

Making

- Select from and use a range of tools and equipment to perform practical tasks such as cutting and joining to allow movement and finishing.
- Select from and use a range of materials and components such as paper, card, plastic and wood according to their characteristics.

Evaluating

- Explore and evaluate a range of products with wheels and axles.
- Evaluate their ideas throughout and their products against original criteria.

Technical knowledge and understanding

- Explore and use wheels, axles and axle holders.
- Distinguish between fixed and freely moving axles.
- Know and use technical vocabulary relevant to the project.

Project title

Design, make and evaluate a _____ (product) for _____ (user) for _____ (purpose)

To be completed by the teacher if using a different context than pre planned

What could children design, make and evaluate?

push/pull toys e.g. emergency service vehicle carnival float farm vehicle
clown's car vehicle for imaginary/story character shopping trolley other – specify

Provided resources

selection of toy vehicles with differently fixed axles, card drill, cutting mat, junior hacksaw, vice,

Other resources

Example cars .card boxes, card, cotton reels, PVA glue, paint, thin/thick paint brushes, felt tip pens, left/right handed scissors, single hole punch, masking tape, dowel, paper/plastic straws, card discs, MDF wheels, wooden wheels

Learning Progression

Investigative and Evaluative Activities (IEAs)

- Explore and evaluate a range of wheeled products such as toys and everyday objects. Through questioning, direct children's observations e.g. the number, size, position and methods of fixing wheels and axles. *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?*
- Draw an example of a wheeled product, stating the user and purpose, and labelling the main parts e.g. body, chassis, wheels, axles and axle holders.
- Walk around the school building and grounds, recording how wheels and axles are used in daily life.

Focused Tasks (FTs)

- Using construction kits with wheels and axles, ask children to make a product that moves.
- Demonstrate to children how wheels and axles may be assembled as either fixed axles or free axles.
- Show different ways of making axle holders and stress the importance of making sure the axles run freely within the holders.
- Ensure that children are taught how to mark out, hold, cut and join materials and components correctly.

Design, Make and Evaluate Assignment (DMEA)

- Discuss with the children what they will be designing, making and evaluating within an authentic context.
- With the children identify a user and purpose for the product and generate simple criteria.
- Ask children to generate, develop and communicate their ideas as appropriate e.g. through talk and drawing. Talk about, evaluate and share ideas with other children/adults.
- Make their wheel and axle product using their design ideas and criteria as an ongoing guide.
- Discuss how the children might add finishing techniques to their product with reference to their design ideas and criteria. Direct the children to information and communication technology opportunities such as clip art, word processing, paint or simple drawing programs.
- Ask children to evaluate their finished product, communicating how it works and how it matches their design criteria, including any changes they made.

Year 1/ 2 Mechanisms – Wheels and Axles

Design and make a wheeled suitcase that can move and carry light objects.

Unit outline:

most children will: have gained an understanding of how simple mechanisms related to moving vehicles work, after clarifying their ideas through discussion; have made a wheeled vehicle which moves and which generally matches their design intention

some children will not have made so much progress and will: have a limited understanding of simple mechanisms; have attempted to create a vehicle which represents their original idea

some children will have progressed further and will: have shown a wider understanding and will have incorporated moving parts eg opening doors and windows, tipping bodies or simple steering into their design, after reflecting on their early ideas; have created a working model which matches their design intention, after having made judgements about what they want the design to do

WALT:	WILF:	Resources	
Investigate the different parts of vehicles	All will: be able to draw a vehicle Most will: draw a vehicle and label key parts Some will: draw a vehicle and label the key parts and explain what they do.	<ul style="list-style-type: none"> powerpoint 	<ul style="list-style-type: none"> toy vehicles (you may want to ask children to bring in some of their own)
Teaching Points		Independent Learning Tasks	
<p>Starter Introduce the term wheels and axles ➤ <i>what are they?</i> Gather ideas from the children and move to slide 3 to share definition.</p> <p>Main teaching Examining different suitcases. Slide 4. Show children the pictures of the lorries and ask the questions</p> <ul style="list-style-type: none"> Do they have wheels? Do they have the same amount of wheels? What shapes can you see? What is their job? <p>Slide 5 show the children the labelled suitcase showing the key parts. Handle to pull it or hold it. Wheels for moving, chassis for strength and to keep the suitcase together.</p> <p>Slide 6. Show the other cases and ask</p> <ul style="list-style-type: none"> Do they have wheels? Do they have the same amount of wheels? What shapes can you see? What is their job? <p>Compare the suitcases. What's the same/different?</p> <p>Slide 7 show the children the labelled suitcase showing the key parts. Wheels for moving, chassis for strength and to keep the suitcase together, body where the driver and passengers sit.</p> <p>Slide 10. Have a range of suitcase on tables ready for children to investigate. Send children to tables in pairs to do the same activity that they have just done with pictures. Children should look at 1 or 2 toys 10 minutes top.</p> <p>Slide 11. Model how to draw a suitcase and include labels about what each part is. Push children to think about what the function of each part is.</p> <p>Plenary What would be the best suitcase for a holiday?</p>		<p>Children to discuss with their partner what a wheel and an axle is.</p> <p>Children investigating the pictures answering the questions in their partners.</p> <p>Children in pairs investigate no more than 2 toys answering the questions on slide 10 (no need for writing)</p> <p>Children complete the investigation worksheet each including labelling the key parts and trying to explain what they do?</p> <p>Children discuss with their partners which vehicle they think would be the best</p>	

WALT:	WILF:	Resources	
Construct a wheel and axle system	All will: create a simple wheel and axle Most will: investigate what happens when axles aren't straight Some will: be able to explain the effect of having axles that aren't straight	<ul style="list-style-type: none"> powerpoint 	<ul style="list-style-type: none"> wooden frames cut straws to hold axle dowel wheels
Teaching Points		Independent Learning Tasks	
<p>Starter Start with asking the question on slide 14. How important is the wheel and the axle to our lives? And allow children to discuss in partners. Relate it to how many things have wheels. What purpose do wheels serve. What wouldn't we be able to do if we didn't have wheels and axles?</p> <p>Main teaching Slide 15. Explain to the children that there are many ways of making a wheel axle system but there are 2 main types. Moving and fixed axle. Use the examples on the teaching board of the 2 systems. We will be making a moving axle system. Show the different ways of making a moving axle system. We will be making the one with the straws to hold the axle. Slide 16. Model how to make a wheel and axle system using the instructions.</p> <ul style="list-style-type: none"> First get a frame. Then get 2 straws and tape them onto the frame. Make sure they are straight and not at an angle Then push your dowel through Finally attach your wheels <p>Children make a system in groups of 2</p> <p>Get children back together and discuss what they found out whilst making the axle system.</p> <ul style="list-style-type: none"> 1 axle isn't straight? Both axles aren't straight? Your wheel doesn't fit right? What did you find hard? <p>Plenary Slide 18. Why might lorries have more wheels?</p>		<p>Children discuss in partners the question</p> <p>Children make a moving axle model using the step by step instructions Once they have built one they can investigate the what happens when questions</p> <p>Children share their experiences to the class in a class discussion</p> <p>Children talk to their partners</p>	

WALT:	WILF:	Resources	
Design a moving suitcase with wheels and axles	<p>All will: be able to draw a simple drawing of their design</p> <p>Most will: be able to label their design with materials used</p> <p>Some will: be able to list some of the materials they need</p>	<ul style="list-style-type: none"> • Powerpoint • Design sheet 	
Teaching Points		Independent Learning Tasks	
<p>Starter What is important to remember when we attach axles to the body of the vehicle?</p> <p>Main teaching Share with children the title - Design and make a wheeled suitcase that can carry light objects. What are the requirements?</p> <p>Slide 22. Show the different designs children able to discuss the points of each one.</p> <p>Slide 23. Design criteria. As a class come up with the design criteria that all the children must follow when designing and making their moving vehicle. Children will be making a vehicle from cardboard boxes and other recyclable material.</p> <p>Slide 24. Go through the questions giving children time to think and come up with answers to give them some more ideas.</p> <ul style="list-style-type: none"> ➢ What do you want your design to look like? ➢ What shapes are you going to use? ➢ How will you join more than 1 box together if you need to? <p>Slide 25. Model how to draw a design on the designing worksheet. Including labels of the wheels axles and boxes used. Keep this up so children can refer to.</p> <p>Mini Plenary Slide 26. As children start to complete their designs discuss the back of the planning sheet where the TEaM list is. What things are they going to need to be able to complete this? Create a start of a list together</p> <p>Plenary Children share their designs with each other</p>		<p>Children discuss in pairs the things that are important when using wheels an axles</p> <p>Which designs do the children think are the best why?</p> <p>Points to note</p> <ul style="list-style-type: none"> • Some children may have very ambitious designs that might be difficult for them to build. This is where a discussion is vital bout how it is going to be made with the resources that will be available to them. <p>Children go and design their model trying to include clear labels of what they are drawing.</p> <p>Children write a list of the tools equipment and materials they are going to need in order to build their suitcase.</p>	

WALT:	WILF:	Resources	
Make a moving suitcase with wheels and axles	The criteria the children came up with last lesson	<ul style="list-style-type: none"> • PowerPoint • Children's design sheets 	<ul style="list-style-type: none"> • cut straws to hold axle • dowel • wheels • boxes (different sizes) • scissors • glue • finishing materials
Teaching Points		Independent Learning Tasks	
<p>Starter</p> <p>Slide 27. Recap the design title and design criteria</p> <p>Design and make a wheeled suitcase that can carry light objects. Get the children to look through their design so they know what they are building.</p> <p>Main sequence</p> <p>Today is the lesson where children are going to be building their design.</p> <p>Slide 28. Where to start. Ask the children what they think they need to start doing first. Children should be starting with building their body and getting the right shape they want.</p> <p>Get the children to tell you what they are starting with one by one. Once they have told you they can get started.</p>		<p>Points to note</p> <ul style="list-style-type: none"> • If you want to keep the models then you will need to purchase the equipment before. <p>Children get started making their suitcase following their plan as close as possible</p> <p>Points to note</p> <ul style="list-style-type: none"> • Dowel will need to be cut to size for the children to attach it to their vehicles. This can either be done by the teacher or by getting the children to cut using saws. • If using the saws this will need to be heavily supervised with small groups. This will need to be on a separate table where people shouldn't be walking past. • If teacher is cutting then strong scissors can be used or by using and saw. This can be done when the children have finished their vehicle. 	

WALT:	WILF:	Resources	
To evaluate a product based on design criteria	<p>All will: be able to write a basic comment about how their product met some of the design criteria</p> <p>Most will: be able to write a comment about their product for each design criteria</p> <p>Some will: be able to evaluate their product overall.</p>	<ul style="list-style-type: none"> • Powerpoint • Evaluation sheet 	Children's completed product
Teaching Points		Independent Learning Tasks	
<p>Starter</p> <p>Allow children time to share their suitcases with the other children in the class or even allow children to walk around the class looking at other people's vehicles. Focus children to look at the design and the finish quality and the other areas of the design spec</p> <p>Discuss with the children who's suitcase like the look of and why. Aim for quality responses like the finishing was need the axles are straight. Not just it looks good.</p> <p>Main Sequence</p> <p>Slide 29. Reap the design criteria and what were the things we needed to achieve in the building of the vehicles (on ppt or wherever you wrote them down). Show of hands who thinks they managed to achieve them.</p> <p>Slide 30. Ask the children to think about these questions</p> <ul style="list-style-type: none"> ➤ Were there any that were harder to achieve than others? ➤ What part of the vehicle did you find the hardest? ➤ What bits worked really well? <p>Slide 30. Model how to use the evaluation sheet on a product going through the design criteria and writing comment for each one.</p> <p>Mini Plenary</p> <p>Slide 32. Discuss how we feel overall about our vehicle do you think it is successful or do you think you would change a few things.</p> <ul style="list-style-type: none"> ➤ Does it set out what it needed to at the start? ➤ Is it presented well? 		<p>Points to note</p> <ul style="list-style-type: none"> • Promote lots of discussion throughout the evaluation stage <p>Children discuss with their partner about what they think was easy hard etc</p> <p>Children evaluate their design following the teacher example</p> <p>Children complete the bottom section evaluating the product overall</p>	

