

Years
1/2

Mechanisms
Wheels and axles

Instant CPD

DESIGN & TECHNOLOGY ASSOCIATION



Tips for teachers

- Ensure a variety of different shaped boxes are available so children can select the one most appropriate for their design.
- Provide wheels with a range of diameters and thicknesses for children to explore and select the most suitable.
- A card disc glued onto a wooden/MDF wheel is easy to draw on to add details using felt tip pens.
- To add a trailer, use flat magnets glued onto the ends of boxes (opposite poles outwards) or short pieces of pipe cleaner bent to form a 'hook and eye'.
- Homework – ask children to complete a checklist of different types of vehicles and how many of each one they see in their local area.
- Homework – ask the children to record a range of wheeled toys. They could record in writing or with pictures such as drawings, cut outs or photographs.

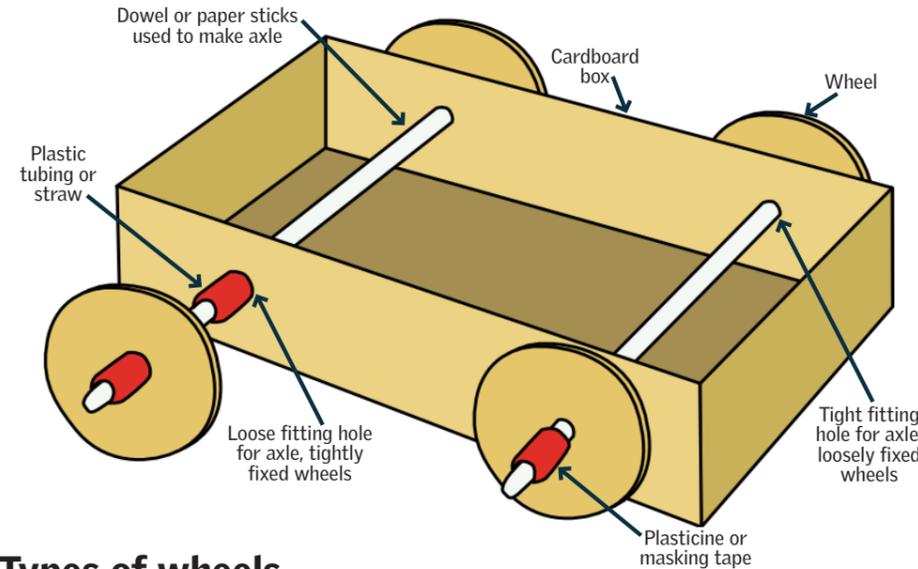
Useful resources at www.designtechnology.org.uk

- Working with wheels and axles (9-11 years but contains useful information)

EYFS Resources

- Let's Look at Vehicles PowerPoints with a range of wheels with discussion prompts and 'design a vehicle for an alien' activity and lesson planning.
- Toys Activities and goals for teaching about toys, including building a toy collection and practical skills.

Two different ways to fix wheels

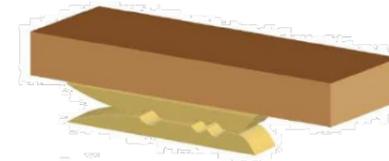


Types of wheels

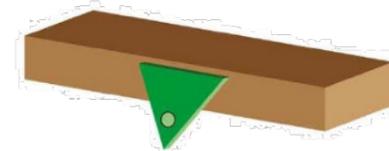


Ways to hold moving axles

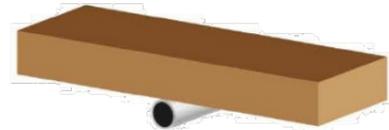
Use **pairs of clothes pegs** glued with PVA to the underside of a box. Check the peg holes are large enough to allow axles to move freely. Make sure they are aligned carefully so the vehicle moves in a straight line when the wheel and axle mechanism is added.



Use **card triangles** with holes for the axle. Check the holes are large enough to allow the axle to move freely. Make sure opposite triangles are aligned carefully so the vehicle moves in a straight line when the wheel and axle mechanism is added.



Use **large paper/plastic straws** fixed with masking tape to the underside of a box. Check straws are positioned carefully so the vehicle will move in a straight line when the wheel and axle mechanisms are added.



Make sure the straw hole is large enough to allow the axle to move freely. The wheels must be fixed tightly to the axle.

Designing, making and evaluating a small wheeled trolley that will carry tools to use in the school garden or for a character in a story

An iterative process is the relationship between a pupil's ideas and how they are communicated and clarified through activity. This is an example of how the iterative design and make process might be experienced by an individual pupil during this project:

THOUGHT	ACTION
Who am I making the trolley for?	Talk about and explore a range of existing wheeled products.
How many wheels will it need? What type of wheels will be best?	Discuss and consider the best size and material from the wheels available. Talk about the surfaces the trolley might have to travel over.
What does it need to carry?	Discuss and list the things that need to be carried.
Should there be sections for different items? How big does each section need to be?	Use drawings and collect different sized and shaped boxes.
Do we want to pull or push it? Which way moves best?	Clarify and model ideas using the boxes.
How could it be appealing as well as functional?	Try out existing trolleys and test out ideas including different types of handles.
What tools, resources and materials will we need?	Talk about and combine ideas to create designs.
What will I do if something does not work as planned?	Think about and collect resources Select appropriate tools.
How will I check the trolley is fit for the user and for its purpose as I make it?	Reflect on and refine ideas and designs as the process develops.
What do I think about my final product.	Frequently test the movement and design of the trolley with and without contents. Reflect and evaluate against the original design criteria.

Glossary

- **Axle** – a rod on which one or more wheels can rotate, either freely or be fixed to and turn with the axle.
- **Axle holder** – the component through which an axle fits and rotates.
- **Chassis** – the frame or base on which a vehicle is built.
- **Friction** – resistance which is encountered when two things rub together.
- **Dowel** – wooden rods used for making axles to hold wheels.

1. Year Groups Years 1/2

2. Aspect of D&T Mechanisms

Focus

Wheels and axles

3. 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.

4. What could children design, make and evaluate?

- | | |
|---|--|
| <input type="checkbox"/> push/pull toys
e.g. emergency service vehicle | <input type="checkbox"/> vehicle for imaginary/story character |
| <input type="checkbox"/> carnival float | <input type="checkbox"/> shopping trolley |
| <input type="checkbox"/> farm vehicle | <input type="checkbox"/> other – specify |
| <input type="checkbox"/> clown's car | |

5. Intended users

- | | |
|---|--|
| <input type="checkbox"/> themselves | <input type="checkbox"/> teddy |
| <input type="checkbox"/> people who help us | <input type="checkbox"/> class doll |
| <input type="checkbox"/> friends | <input type="checkbox"/> other – specify |
| <input type="checkbox"/> story character | |
| <input type="checkbox"/> farmers/farm animals | |

7. Links to topics and themes

- | | |
|--|--|
| <input type="checkbox"/> People Who Help Us | <input type="checkbox"/> Fairy Tales |
| <input type="checkbox"/> Helping Others | <input type="checkbox"/> Transport |
| <input type="checkbox"/> Our Local Community | <input type="checkbox"/> Nursery Rhymes |
| <input type="checkbox"/> Food and Farming | <input type="checkbox"/> Toys |
| <input type="checkbox"/> Traditional Stories | <input type="checkbox"/> other - specify |

8. Possible contexts

- | | |
|--------------------------------------|--|
| <input type="checkbox"/> imaginary | <input type="checkbox"/> culture |
| <input type="checkbox"/> story-based | <input type="checkbox"/> local community |
| <input type="checkbox"/> home | <input type="checkbox"/> other - specify |
| <input type="checkbox"/> school | |
| <input type="checkbox"/> leisure | |

10. 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.
- Read a story or non-fiction book that includes a wheeled product. Use this to introduce relevant vocabulary and to emphasise user and purpose.

12. 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.
- Using samples of materials and components they will use when designing and making, ask the children to assemble some examples of wheel, axle, axle holder combinations. Display the work completed as a reference for their DMEA.

14. 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.

6. Purpose of products

- | | |
|--|--|
| <input type="checkbox"/> making work or everyday life easier | <input type="checkbox"/> solving a problem for a story character |
| <input type="checkbox"/> moving objects | <input type="checkbox"/> other – specify |
| <input type="checkbox"/> toy vehicle to play with | |

9. Project title

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

To be completed by the teacher. Use the project title to set the scene for children's learning prior to activities in 10, 12 and 14.

11. Related learning in other subjects

- Science** – working scientifically: ask simple questions and observe closely. Explore use of everyday materials.
- Mathematics** – number of wheels, more than, less than, equal.
- Spoken Language** – use of technical vocabulary. Ask relevant questions to extend understanding and build vocabulary and knowledge.

13. Related learning in other subjects

- Spoken language** – give well-structured descriptions and explanations. Develop speaking and listening skills. Learn relevant technical vocabulary.
- Mathematics** – measuring length using non-standard and standard units.

15. Related learning in other subjects

- Spoken language** – use spoken language to develop understanding through imagining and exploring ideas.
- Art and Design** – use a range of media and materials creatively to design and make products.
- Computing** – use technology purposefully to create and manipulate digital content.
- Mathematics** – measurement using non-standard and standard units.

16. Possible resources

- selection of toy vehicles with differently fixed axles
- card boxes, card, cotton reels, plastic tubing, dowel, clothes pegs, paper sticks/dowel, paper/plastic straws, card discs, MDF wheels, wooden wheels
- single hole punch, card drill, cutting mat, masking tape, PVA glue, paint, thin/thick paint brushes, felt tip pens, decorative paper, double sided sticky fixers, junior hacksaw, vice, left/right handed scissors

17. Key vocabulary

- vehicle, wheel, axle, axle holder, chassis, body, cab
- assembling, cutting, joining, shaping, finishing, fixed, free, moving, mechanism
- names of tools, equipment and materials used
- design, make, evaluate, purpose, user, criteria, functional

18. Key competencies

problem-solving, teamwork, negotiation, consumer awareness, organisation, motivation, persuasion, leadership, perseverance, other – specify

19. Health and safety

Pupils should be taught to work safely, using tools, equipment, materials, components and techniques appropriate to the task. Risk assessments should be carried out prior to undertaking this project.

20. Overall potential of project

