1. Year Groups

Years 1/2

2. Aspect of D&T

Structures

Focus

Freestanding structures

3. Key learning in design and technology

Prior learning

- Experience of using construction kits to build walls, towers and frameworks.
- Experience of using of basic tools e.g. scissors or hole punches with construction materials e.g. plastic, card.
- Experience of different methods of joining card and paper.

Designing

- Generate ideas based on simple design criteria and their own experiences, explaining what they could make.
- Develop, model and communicate their ideas through talking, mock-ups and drawings.

Making

- Plan by suggesting what to do next.
- Select and use tools, skills and techniques, explaining their choices.
- Select new and reclaimed materials and construction kits to build their structures.
- Use simple finishing techniques suitable for the structure they are creating.

Evaluating

- Explore a range of existing freestanding structures in the school and local environment e.g. everyday products and buildings.
- Evaluate their product by discussing how well it works in relation to the purpose, the user and whether it meets the original design criteria.

Technical knowledge and understanding

- Know how to make freestanding structures stronger, stiffer and more stable.
- Know and use technical vocabulary relevant to the project.

4. What could children design, make and evaluate?

enclosures for farm or zoo animals

playground/park/garden furniture

bridge for Billy Goats Gruff playground equipment

furniture for the Three Bears other – specify

5. Intended users

themselves school community friends

children of different ages general public

older people story characters teddy animal

other – specify

6. Purpose of products

imaginary role-play pleasure

rest recreation health leisure

other – specify

7. Links to topics and themes

Traditional Tales Nursery Rhymes

Buildings Healthy living Farming

Our School Myself Animals

Parks and Playgrounds other - specify

8. Possible contexts

imaginary story-based classroom school

grounds gardens local community leisure

health environment other - specify

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.

10. Investigative and Evaluative Activities (IEAs)

- Go on a walk and/or look at photographs of the local area to explore structures such as playground equipment, street furniture, walls, towers and bridges e.g. *What are the structures called and what is their purpose? Who might use them? What materials have been used? Why have these been chosen? How have the parts been joined together? How have the structures been made strong enough? How have they been made stable?*
- Where possible, ask the children to draw or photograph the structures they have been exploring and label with the correct technical vocabulary in relation to the structure, materials used and shapes e.g. wall, tower, framework, base, joint, metal, wood, plastic, brick, triangle, square, rectangle, cuboid, cube.

11. Related learning in other subjects

- **Geography** – use simple fieldwork and observational skills to study the geography of their school and its grounds and the key physical features of its surrounding environment.
- **Spoken language** – participate in discussion about various structures, taking turns and listening to what others say. Ask relevant questions to extend their knowledge and understanding. Build technical vocabulary.

12. Focused Tasks (FTs)

- Demonstrate measuring, marking out, cutting, shaping, joining and finishing techniques with a range of tools and new and reclaimed materials that children are likely to use to make their structures. Discuss the suitability of materials for their products according to their characteristics.
- Ask the children to build and explore a variety of freestanding structures using construction kits, such as wooden blocks, interconnecting plastic bricks and those that make frameworks e.g. *How can you stop your structures from falling over? How they can be made stronger and stiffer in order to carry a load?* Children could make models of the structures they have seen in school and the local area.
- Ask children to fold paper or card in different ways to make freestanding structures, using masking tape where necessary to make joins. Encourage them to think about how folding materials can make them stronger, stiffer, stand up and be more stable e.g. *Can they support an object on top of their structures without it falling over or breaking?*

13. Related learning in other subjects

- **Mathematics** – use appropriate standard and non-standard measures. Recognise and name common 2-D and 3-D shapes.
- **Science** – think about the properties of materials that make them suitable or unsuitable for particular purposes.
- **Spoken language** – ask relevant questions to extend their knowledge and understanding. Build technical vocabulary.

14. Design, Make and Evaluate Assignment (DMEA)

- Discuss with the children what structure they will be designing, making and evaluating e.g. *Who will your product be for? What will be its purpose? What materials will you use? How will you make it strong and stable?*
- Generate some simple design criteria with the children e.g. the structure should stand up on its own, it should be strong enough to carry Teddy.
- Encourage the children to develop their ideas through talking, drawing and making mock-ups of their ideas with construction kits and other materials.
- As a whole class, plan the order in which the structures will be made. Children could make their final products from construction kits, new and reclaimed materials or any combination of these, according to their characteristics.
- Ask children to evaluate their developing ideas and final products against original design criteria.

15. Related learning in other subjects

- **Spoken language** – ask relevant questions to extend their knowledge and understanding. Build technical vocabulary. Use spoken language to develop understanding through imagining and exploring ideas.
- **Art and design** – use colour, pattern, line, shape. Use and develop drawing skills.
- **Science** – think about the properties of materials that make them suitable or unsuitable for particular purposes.

16. Possible resources

photographs of various structures

construction kits that can be used to construct freestanding structures e.g. walls, towers, frameworks

paper, card, plastic sheet, paper and plastic straws, pipe cleaners

reclaimed materials including small containers, card boxes, cotton reels

string, masking tape

PVA glue, Plasticine, left/right handed scissors, hole punch, stapler

finishing media and materials

17. Key vocabulary

cut, fold, join, fix

structure, wall, tower, framework, weak, strong, base, top, underneath, side, edge, surface, thinner, thicker, corner, point, straight, curved

metal, wood, plastic

circle, triangle, square, rectangle, cuboid, cube, cylinder

design, make, evaluate, user, purpose, ideas, design criteria, product, function

18. Key competencies

problem-solving teamwork negotiation

consumer awareness organisation motivation

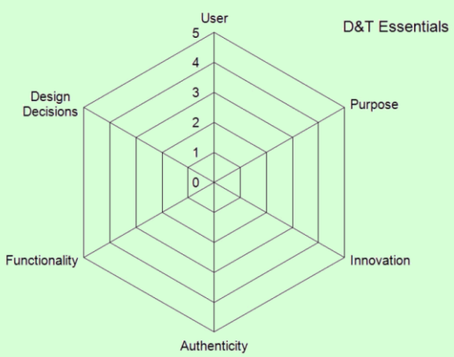
persuasion leadership perseverance

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



Years 1/2

Structures
Freestanding structures

Instant CPD

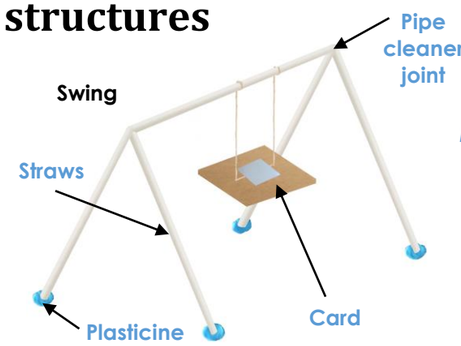
Tips for teachers

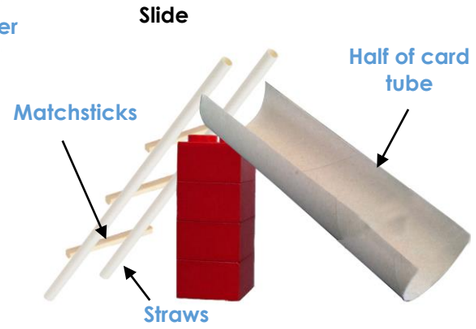
- ✓ Create a PowerPoint or range of pictures showing a variety of freestanding structures relevant to the product the children are designing and making.
- ✓ Exploring structures in the local area provides a good opportunity to develop children's observational drawing.
- ✓ Create and display a word bank of relevant technical vocabulary in the classroom.
- ✓ Ensure that work with construction kits and materials builds on children's prior experience in the Early Years Foundation Stage (EYFS).
- ✓ Ensure that different types of construction kits are available for children to explore through focused tasks.
- ✓ It is perfectly acceptable for children's final products to include both construction kits and consumable materials.
- ✓ Demonstrate measuring, marking out, cutting, joining and strengthening techniques and provide help sheets showing instructions for the children to practise independently.
- ✓ Prior to producing their designs, have a range of materials available for children to access and create models.

Useful resources at www.data.org.uk

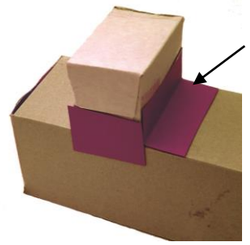
- Door hinges helpsheet
- Let's Get Building and Using Construction Kits Effectively
- Chairs for Three Bears
- Hinges and Catches
- Picture Frames and holders
- Working with Plastics
- Bird Hides Dragons' Den Challenge (Yrs 5-6)
- Working with paper straws (Yrs 3-4)

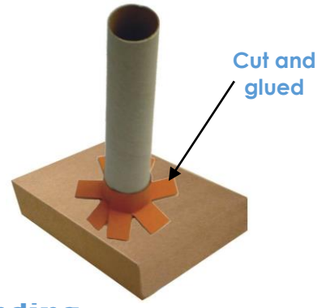
Techniques for assembling freestanding structures





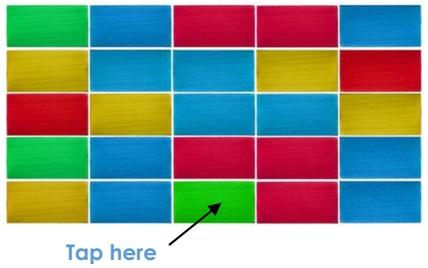
Show children how to join sheet materials and reclaimed boxes together using different tapes and glues.

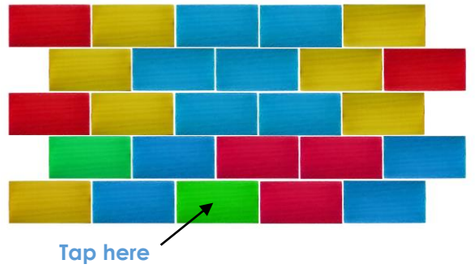


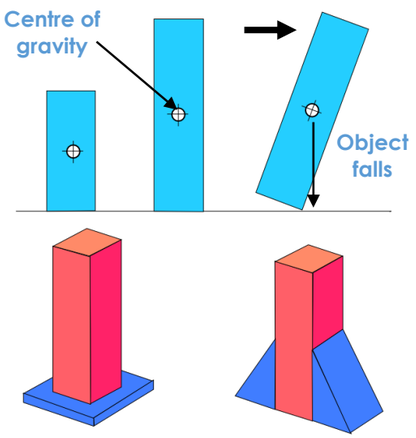


Technical knowledge and understanding

Build walls with these different patterns. Tap away the centre brick in the bottom row of each wall in turn. What happens? Which wall is the strongest?







As a freestanding structure becomes taller its centre of gravity rises. Stability in a structure can generally be increased by making the base wider, making the base heavier or adding buttresses.

Ask the children to build and explore a variety of freestanding structures through focused tasks. Use a range of construction kits.

Designing, making and evaluating a strong chair for Baby Bear

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
What sort of chair shall I make? Who is it for and what is it for?	Choose an appropriate soft toy Generating ideas through talking and drawing based on own experiences.
How can I make sure it is strong, stiff and stable?	Developing ideas using construction kits to create mock-ups.
Which joining techniques will work best for the chair?	Exploring and evaluating joining techniques.
What media, materials and kits will I use?	Exploring and evaluating construction kits, new and reclaimed materials.
What shall I do first? What tools and techniques will I use? What materials shall I use?	Selecting from a range of tools, techniques and materials Explaining choices.
More thoughts… judging, planning, generating new ideas.	More actions… making, testing, modifying.
Will the chair meet the needs of the user and achieve its purpose?	Evaluating the chair with a soft toy and against design criteria.

Glossary

- **Freestanding structure** – a structure that stands on its own foundation or base without attachment to anything else.
- **Frame structure** – a structure made from thin components e.g. tent frame.
- **Shell structure** – a hollow structure with a thin outer covering.
- **Stability** – in relation to a freestanding structure, the extent to which it is likely to fall over if a force is applied.
- **Buttress** – a structure added to a wall, tower or framework to make it more stable and/or reinforce it.
- **Brick bonding** – arranging bricks in a wall to improve the performance of the structure or improve its appearance.
- **Mock-up** – 3-D representation of a product.