

Lyppard Grange DT Knowledge organiser

Year 5

Structures- Frame Structures

Design, make and evaluate a _____ (product) for _____ (user) for _____ (purpose) – (to be completed by year group)

Examples of possible design and make tasks- shelter, tent, bird hide, play house etc.



Key Knowledge

- To know how to strengthen, stiffen and reinforce 3D frameworks

Skills

- Carry out research into users needs and existing products (surveys, interviews, questionnaires, web-based resources)
- Develop a design specification taking account of time constraints, resources and cost
- Generate ideas through discussion, prototypes and annotated sketches
- Create a step-by-step plan including list of resources
- Select and use tools competently to measure, mark out, cut, shape and join materials to make frameworks.
- Use finishing/ decorative techniques suitable for the product
- Investigate frame structures
- Evaluate products against design criteria/ user and purpose and carrying out appropriate tests.

Useful links- Bird Hides Dragon' Den Challenge resources. (saved in year 5 area and DT folder- resources)

Vocabulary

Frame structure, stiffen, stability, strengthen, reinforce, triangulation, stability, diagonal, horizontal, vertical

Triangulation – the use of triangular shapes to strengthen a structure.

Frame structure – a structure made from thin components
e.g. tent frame

IEAs-

Investigate and make annotated drawings of a range of frame structures, e.g. tents, shelters, play houses, bus shelters, football stadiums. How well does the frame structure meet users' needs and purposes? Why were materials chosen? What methods of construction have been used? How has the framework been strengthened, reinforced and stiffened? How does the shape of the framework affect its strength? How innovative is the design? When was it made? Who made it? Where was it made?

Focused Tasks (FTs) –

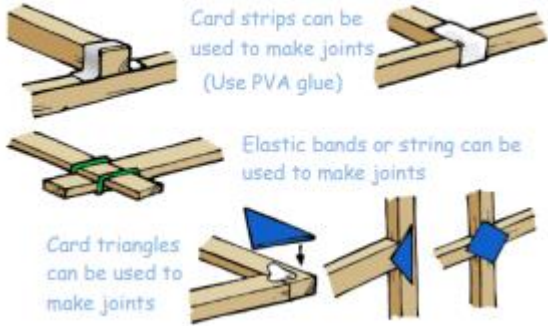
Compare the strength of square frameworks with triangular frameworks. Ask the children to reinforce square frameworks using diagonals to help develop an understanding of using triangulation to add strength to a structure.

- Demonstrate how paper tubes can be made from rolling sheets of newspaper diagonally around pieces of e.g. dowel. Ask children to use these tubes and masking tape or paper straws with pipe cleaners to build 3-D frameworks such as cubes, cuboids and pyramids. How could each of the frameworks be reinforced and strengthened? Using lolly pop sticks or card strips.
- Demonstrate the accurate use of tools and equipment. Develop skills and techniques using junior hacksaws, G-clamps, bench hooks, square section wood, card triangles and hand drills to construct wooden frames, as appropriate.
- Demonstrate skills and techniques for accurately joining framework materials together e.g. paper straws, square sectioned wood. Ask children to practise these, mounting their joints onto card for future reference.

Design, Make and Evaluate Assignment (DMEA)

- Discuss the brief of designing and making a small-scale frame structure e.g. Who is the intended user and what is the purpose of the frame structure? What materials will you use? How will it be joined? How will it be reinforced? How will it be finished? Children should be encouraged to generate innovative ideas, drawing on their research. Ask children to develop a simple design specification to guide their thinking.
- Children should produce a detailed, step-by-step plan, listing tools and materials.
- Children's sketches should be annotated with notes to help develop and communicate their ideas.
- Encourage children to model their ideas first using materials such as paper, card and paper straws e.g. How will you make it stable? How will it stand up? How could you make it stronger? Where are the weak points? How could you reinforce them? What tools and materials will you need? How can you improve the design?
- Encourage children to make their products with accuracy. They should regularly evaluate their work and their completed product, drawing on their design specification, and thinking about the intended purpose and user.

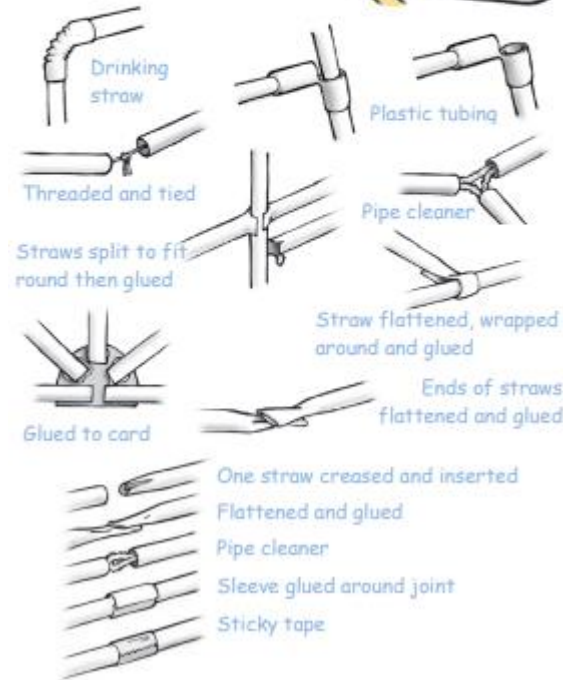
Joining thin sectioned pieces of wood



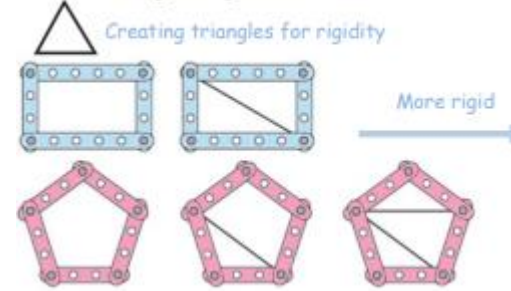
Techniques for building frame structures



Joining straws

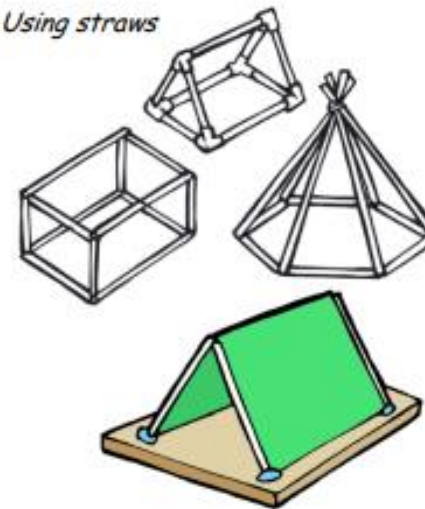


Understanding triangulation

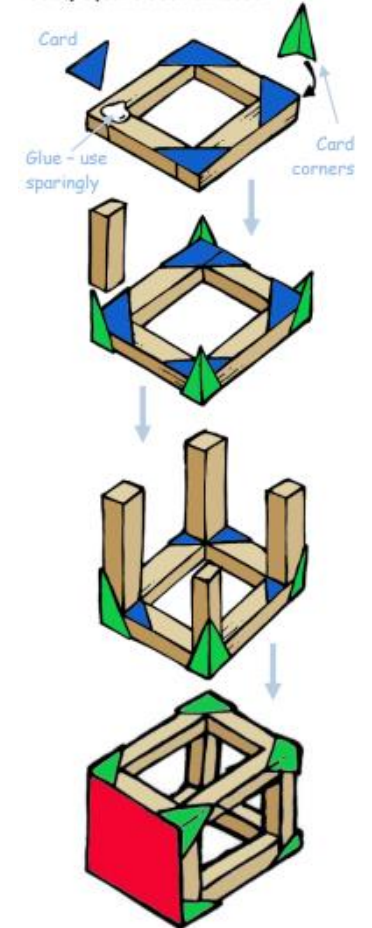


Making small-scale frame structures

Using straws



Using square section wood



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.

See risk assessments saved in staff shared.

Risk assessments- mechanics and construction.

Top Tips-

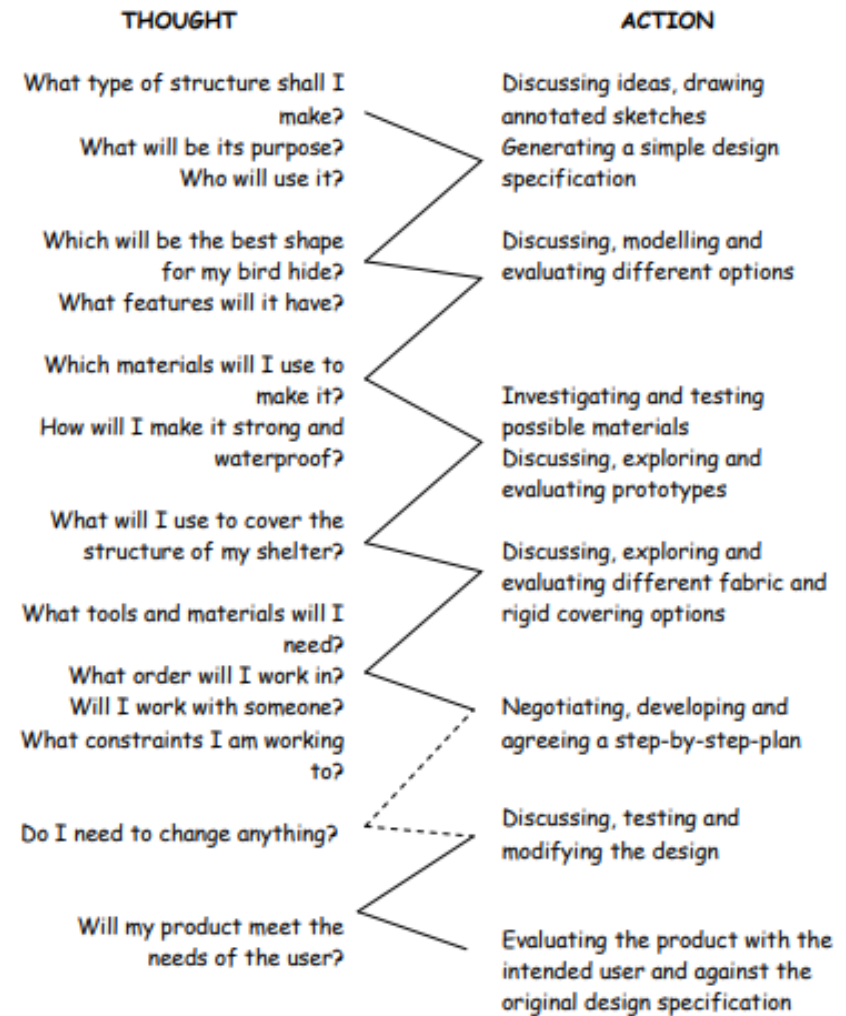
- Collect a range of photographs of different frame structures, both portable and permanent e.g. tents, bus shelters, bird hides. Include examples constructed with external and internal frameworks e.g. play tent.
 - Ensure children are familiar with materials they are likely to use
- Ensure children use simple tests to evaluate the functionality and strength of products

See Bird Hide Challenge for helpful resources.

Kapow links- Year 6- Structures Playgrounds/ Year 5- Structures- Bridges (Both have some useful videos and tips for FTPS- Building structures – developing strength and stability- triangulation.

Designing and making a small-scale bird hide for children to use in the school wildlife area

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:



This follows on from-

Year 2- freestanding structures

(a structure that stand on its own)

Knowledge-

- To know how to join materials together effectively
- To know that a range of tools can be used for different purposes e.g. cutting, sticking, bending, joining
- To understand how structures can be made stiffer, stronger and more stable

Skills –

- Explore initial ideas using drawings and mock-ups
- To measure and mark out materials using safe ways of cutting
- To investigate ways to strengthen materials by folding, joining or rolling
- Evaluate their ideas and review their product against design criteria

Year 3- shell structures

(a hollow structure with a thin outer covering)

Knowledge-

- To know how to construct strong, stiff shell structures
- Develop and use knowledge of nets of cubes, cuboids and other 3d structures (where appropriate)
- Know how to use and manipulate materials to create a structure

Skills-

- Use research to inform the design criteria for structures suitable to the context of the era
- To investigate the construction of existing structures
- Develop ideas using annotated sketches and prototypes
- Use computer aided design to create nets for their products
- Investigate ways of stiffening and strengthening structures e.g. corrugating, ribbing, folding, laminating
- Use tools to measure, mark out, cut, score, shape and assemble nets made out of card
- Evaluate their products against the design criteria and purpose