**Progress in Design Technology – Structures**

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|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| **Structures** | **Example project:**  **Windmills**  **Content: Design and make own structure.**  **Design:**  Use existing knowledge to generate their own designs for themselves or others.  Begin to develop and communicate ideas by talking and drawing.  **Make:**  Assemble components to work together to create motion.  Select from a range of tools, materials and components.  Follow procedures for safety.  Measure, mark out, shape and cut materials.  **Evaluate:**  Test the finished product.  Talk about how to make their product better.  **Technical knowledge:**  Understand what mechanisms are.  Understand how to turn 2D nets into 3D structures.  Use learning from science, maths and other subjects to help design and make products that work. | **Example project:**  **Baby Bear’s Chair**  **Content: experiment with different shapes. Manipulate materials. Explore structural properties.**  **Design:**  Say how their product is suitable for the intended user.  Use simple design criteria.  Draw on experience and knowledge of existing products.  Develop and communicate ideas by talking, drawing and ICT where appropriate.  Model ideas by exploring materials, components  Make templates and mock-ups.  **Make:**  Select from a range of tools, materials and components.  Follow procedures for safety.  Measure, mark out, shape, cut and assemble materials and components with some accuracy.  **Evaluate:**  Test the finished product.  Talk about how to make their product better.  **Technical knowledge:**  Understand the definition and importance of strength, stability and stiffness.  Know that different shapes can strengthen or weaken structures and that materials can be manipulated to improve strength and stiffness.  Use learning from science, maths and other subjects to help design and make products that work. | **Example projects:**  **Castles**  **Content: Learn more advanced construction techniques and evaluate throughout.**  **Design:**  Establish and use a design criterion to help focus and evaluate their work.  Use the views of others to improve designs.  Describe the purpose and design features of their products.  Model ideas using prototypes.  Generate and communicate ideas using annotated diagrams and some computer-aided design packages where appropriate.  **Make:**  Use more demanding practical skills such as paper engineering and paper folding techniques.  Order the main stages of making.  Follow procedures for safety.  Measure, mark out, cut, shape, assemble, join and combine a range of materials and components with some accuracy.  Apply some finishing techniques.  **Evaluate:**  Identify strengths and areas for development, considering the views of others.  Evaluate throughout the design and make process, referring to the criteria.  Investigate and analyse how well products have been made and whether they achieved their purpose.  **Technical knowledge:**  Application of prior knowledge and increasing knowledge of nets. Use learning from science, maths and other subjects to help design and make products that work. | **Example projects:**  **Pavilions**  **Content: Advanced construction techniques using a wide range of materials.**  **Design:**  Design within a given context.  Model ideas using prototypes.  Use the views of others to improve designs.  Use annotated sketches, some cross-sectional drawings and computer-aided design packages to develop and communicate ideas.  Make design decisions that take account of the availability of resources.  **Make:**  Confidently select tools, materials and equipment suitable for making frame structures and explain their choices giving evidence.  Order the main stages of making in logical steps.  Follow procedures for safety.  Measure, mark out, cut, shape, assemble, join and combine a range of materials and components with accuracy.  Accurately apply several finishing techniques.  **Evaluate:**  Discuss the structure of existing pavilions.  Identify the strengths and areas for development in their own and other’s designs.  Refer to their design criteria as they design, make and evaluate.  Investigate and analyse how well products have been made and whether they achieved their purpose.  Recognise several influential inventors, designers and engineers.  **Technical knowledge:**  Know what a pavilion is.  Build on prior knowledge of net structures and broaden knowledge of frame structures.  Know that architects consider light, shadow and patterns when designing.  Use learning from science, maths and other subjects to help design and make products that work. | **Example projects:**  **Bridges**  **Content: Structures, forces and components.**  **Design:**  Design arch and truss bridges.  Describe in detail the purpose of their products and indicate design features.  Develop their own design criteria and specification and use this to inform their ideas.  Share and clarify ideas confidently through discussion.  Model ideas using prototypes.  Use annotated sketches, cross-sectional drawings, exploded diagrams and computer-aided design packages to develop and communicate ideas.  Generate realistic ideas, focussing on the needs of the user.  Make design decisions that take account of the availability of resources.  Generate innovative ideas from prior research.  Make design decisions based on time, cost and resources constraints.  **Make:**  Select materials and equipment according to functional properties.  Use triangulation for bracing.  Formulate step-by-step plans as a guide to making.  Use an extensive range of materials and components.  Measure, mark out, cut, shape, assemble, join and combine most materials and components with accuracy.  Accurately apply several finishing techniques including those from art and design sessions.  Use techniques that several steps.  Be resourceful when tackling practical problems.  **Evaluate:**  Test to destruction to evaluate the successful and unsuccessful properties of the design.  Critically evaluate the quality of the design, manufacture and fitness for purpose of their products.  Investigate and analyse how well products have been made and whether they achieved their purpose.  Recognise several influential inventors, designers and engineers.  Consider cost and sustainability.  **Technical knowledge:**  Use learning from science, maths and other subjects.  Understand compression and tension in structures.  Reinforce and strengthen a 3d framework. | **Example projects:**  **Playgrounds**  **Content: Apply prior knowledge of net and frame structures as well as bracing and cladding.**  **Design:**  Establish and use a design criterion.  Carry out research e.g. surveys, questionnaires and web-based resources to identify user’s preferences.  Develop a detailed design specification to guide their thinking and planning.  Model ideas using prototypes and pattern pieces.  Use annotated sketches, cross-sectional drawings, exploded diagrams and computer-aided design packages to develop and communicate ideas.  Make design decisions based on time, cost and resources constraints.  **Make:**  Measure, mark out, cut, shape, assemble, join and combine most materials and components with accuracy.  Select materials for their aesthetic as well as functional properties.  Effectively strengthen and stiffen structures.  Formulate step by-step plans as a guide to making.  Accurately apply several finishing techniques.  Use resourcefulness, resilience and innovation when tackling practical problems.  Explain next steps in learning drawing from prior experience.  **Evaluate:**  Explore existing playground structures.  Critically evaluate the quality of the design, manufacture and fitness for purpose of their products.  Evaluate their ideas and products against their original design specification.  Investigate and analyse how well products have been made and whether they achieved their purpose.  Investigate and analyse how much products cost; how innovative products are; how sustainable the materials in products are; what impact products have beyond their intended purpose.  **Technical knowledge:**  Use learning from science, maths and other subjects.  Apply knowledge of construction techniques to realise design ideas.  Stabilise more complex structures using bracing. |