

## Structures: Year 6

### Frame structures

#### Key learning in design and technology

##### Prior learning

- Experience of using measuring, marking out, cutting, joining, shaping and finishing techniques with construction materials.
- Basic understanding of what structures are and how they can be made stronger, stiffer and more stable.

##### Designing

- Carry out research into user needs and existing products, using surveys, interviews, questionnaires and web-based resources.
- Develop a simple design specification to guide the development of their ideas and products, taking account of constraints including time, resources and cost.
- Generate, develop and model innovative ideas, through discussion, prototypes and annotated sketches.

##### Making

- Formulate a clear plan, including a step-by-step list of what needs to be done and lists of resources to be used.
- Competently select from and use appropriate tools to accurately measure, mark out, cut, shape and join construction materials to make frameworks.
- Use finishing and decorative techniques suitable for the product they are designing and making.

##### Evaluating

- Investigate and evaluate a range of existing frame structures.
- Critically evaluate their products against their design specification, intended user and purpose, identifying strengths and areas for development, and carrying out appropriate tests.
- Research key events and individuals relevant to frame structures.

##### Technical knowledge and understanding

- Understand how to strengthen, stiffen and reinforce 3-D frameworks.
- Know and use technical vocabulary relevant to the project.



#### Key vocabulary

Frame structure, stiffen, strengthen, reinforce, triangulation, stability, shape, join, temporary, permanent

Design brief, design specification, prototype, annotated sketch, purpose, user, innovation, research, functional

#### Investigative and Evaluative Activities (IEAs)

- Discuss, investigate and, where practical, disassemble different examples of relevant battery-powered products, including those which are commercially available e.g. *Where and why they are used? How does the product work? What are its key features and components? How does the switch work? Is the product manually controlled or controlled by a computer? What materials have been used and why? How is it suited to its intended user and purpose?*
  - Ask children to investigate examples of switches, including those which are commercially available, which work in different ways e.g. push-to-make, push-to-break, toggle switch. Let the children use them in simple circuits e.g. *How might different types of switches be useful in different types of products?*
  - Remind children about the dangers of mains electricity.

#### Focused Tasks (FTs)

- Recap with the children how to make manually controlled, simple series circuits with batteries and different types of switches, bulbs and buzzers. Discuss which of the components in the circuit are input devices e.g. switches, and which are output devices e.g. bulbs and buzzers.
  - Demonstrate how to find a fault in a simple circuit and correct it, giving pupils opportunities to practise.
  - Use a simple computer control program with an interface box or standalone control box to physically control output devices e.g. bulbs and buzzers.
  - Ask the children to make a variety of switches by using simple classroom materials e.g. card, corrugated plastic, aluminium foil, paper fasteners and paper clips. Encourage children to make switches that operate in different ways e.g. when you press them, when you turn them, when you push them from side to side. Ask the children to test their switches in a simple series circuit.
  - Teach children how to avoid making short circuits.

#### Design, Make and Evaluate Assignment (DMEA)

- Develop a design brief with the children within a context which is authentic and meaningful.
  - Discuss with children the purpose of the battery-powered products that they will be designing and making and who they will be for. Ask the children to generate a range of ideas, encouraging realistic responses. Agree on design criteria that can be used to guide the development and evaluation of the children's products, including safety features.
  - Using annotated sketches, cross-sectional and exploded diagrams, as appropriate, ask the children to develop, model and communicate their ideas.
  - Ask the children to consider the main stages in making and testing before assembling high quality products, drawing on the knowledge, understanding and skills learnt through IEAs and FTs.
  - Evaluate throughout and the final products against the intended purpose and with the intended user, drawing on the design criteria previously agreed.

## Electrical systems: Year 6

### More complex switches and circuits

#### Key learning in design and technology

##### Prior learning

- Understanding of the essential characteristics of a series circuit and experience of creating a battery-powered, functional, electrical product.
- Initial experience of using computer control software and an interface box or a standalone box, e.g. writing and modifying a program to make a light flash on and off.

##### Designing

- Use research to develop a design specification for a functional product that responds automatically to changes in the environment. Take account of constraints including time, resources and cost.
- Generate and develop innovative ideas and share and clarify these through discussion.
- Communicate ideas through annotated sketches, pictorial representations of electrical circuits or circuit diagrams.

##### Making

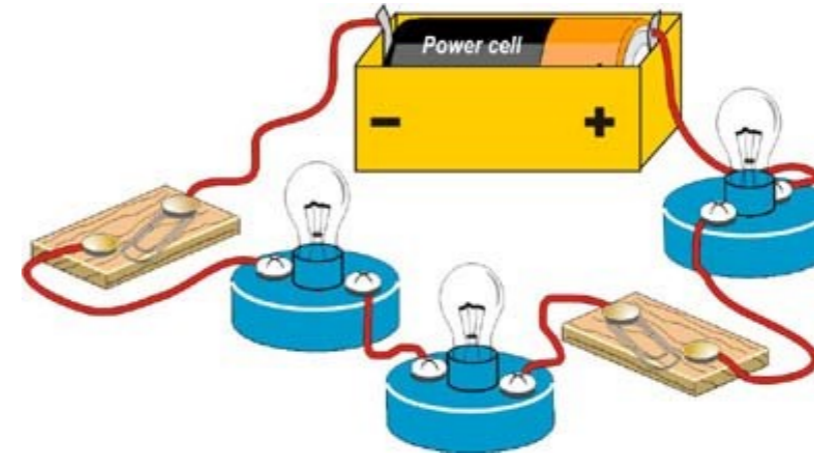
- Formulate a step-by-step plan to guide making, listing tools, equipment, materials and components.
- Competently select and accurately assemble materials, and securely connect electrical components to produce a reliable, functional product.
- Create and modify a computer control program to enable an electrical product to work automatically in response to changes in the environment.

##### Evaluating

- Continually evaluate and modify the working features of the product to match the initial design specification.
- Test the system to demonstrate its effectiveness for the intended user and purpose.
- Investigate famous inventors who developed ground-breaking electrical systems and components.

##### Technical knowledge and understanding

- Understand and use electrical systems in their products.
- Apply their understanding of computing to program, monitor and control their products.
- Know and use technical vocabulary relevant to the project.



#### Key vocabulary

Series circuit, parallel circuit, names of switches and components, input device, output device, system, monitor, control, program, flowchart

Function, innovative, design specification, design brief, user, purpose

#### Investigative and Evaluative Activities (IEAs)

- Using research, discuss a range of relevant products that respond to changes in the environment using a computer control program such as automatic nightlights, alarm systems, security lighting e.g. *Who have the products been designed for and for what purpose? How and why is a computer control program used to operate the products? What input devices, e.g. switches, and output devices, e.g. bulbs, have been used?*
- Investigate electrical sensors such as light dependent resistors (LDRs) and a range of switches such as push-to-make switches, push-to-break switches, toggle switches, micro switches and reed switches. To gain an understanding of how they are operated by the user and how they work, ask the children to use each component to control a bulb in a simple circuit. Remind children about the dangers of mains electricity.
- Children could research famous inventors related to the project e.g. Thomas Edison – light bulb.

#### Focused Tasks (FTs)

- Through teacher demonstration and explanation, recap measuring, marking out, cutting and joining skills with construction materials that children will need to create their electrical products.
- Demonstrate and enable children to practise methods for making secure electrical connections e.g. using automatic wire strippers, twist and tape electrical connections, screw connections and connecting blocks.
- Drawing on science understanding, ask the children to explore a range of electrical systems that could be used to control their products, including a simple series circuit where a single output device is controlled, a series circuit where two output devices are controlled by one switch and, where appropriate, parallel circuits where two output devices are controlled independently by two separate switches.
- Drawing on related computing activities, ensure that children can write computer control programs that include inputs, outputs and decision making. Test out the programs using electrical components connected to interface boxes or standalone boxes.
- Teach children how to avoid making short circuits.

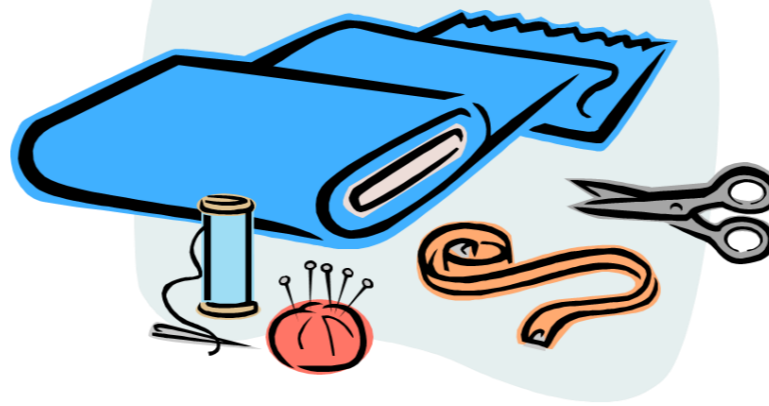
#### Design, Make and Evaluate Assignment (DMEA)

- Develop an authentic and meaningful design brief with the children.
- Ask the children generate innovative ideas by drawing on research and develop a design specification for their product, carefully considering the purpose and needs of the intended user.
- Communicate ideas through annotated sketches, pictorial representations of electrical circuits or circuit diagrams. Drawings should indicate the design decisions made, including the location of the electrical components and how they work as a system with an input, process and output.
- Produce detailed step-by-step plans and lists of tools, equipment and materials needed. If appropriate, allocate tasks within a team.
- Make high quality products, applying knowledge, understanding and skills from IEAs and FTs. Create and modify a computer control program to enable the product to work automatically in response to changes in the environment.
- Critically evaluate throughout and the final product, comparing it to the original design specification. Test the system to demonstrate its effectiveness for the intended user and purpose.

## Textiles: Year 6

### Using computer-aided design (CAD) in textiles

Design, make and evaluate a cushion for a year 6 leaver to help them remember their time at St Bernard's.



#### Key learning in design and technology

##### Prior learning

- Experience of stitching, joining and finishing techniques in textiles.
- Experience of making and using textiles pattern pieces.
- Experience of simple computer-aided design applications.

##### Designing

- Generate innovative ideas through research including surveys, interviews and questionnaires.
- Develop, model and communicate ideas through talking, drawing, templates, mock-ups and prototypes including using computer-aided design.
- Design purposeful, functional, appealing products for the intended user that are fit for purpose based on a simple design specification.

##### Making

- Produce detailed lists of equipment and fabrics relevant to their tasks.
- Formulate step-by-step plans and, if appropriate, allocate tasks within a team.
- Select from and use a range of tools and equipment, including CAD, to make products that are accurately assembled and well finished. Work within the constraints of time, resources and cost.

##### Evaluating

- Investigate and analyse textile products linked to their final product.
- Compare the final product to the original design specification.
- Test products with intended user, where safe and practical, and critically evaluate the quality of the design, manufacture, functionality and fitness for purpose.
- Consider the views of others to improve their work.

##### Technical knowledge and understanding

- A 3-D textile product can be made from a combination of accurately made pattern pieces, fabric shapes and different fabrics.
- Fabrics can be strengthened, stiffened and reinforced where appropriate.

#### Key vocabulary

Computer aided design (CAD), computer aided manufacture (CAM)  
Font, lettering, text, graphics, scale, modify, repeat, copy, flip design,  
Brief, design criteria, design decisions, innovative, prototype  
Seam, seam allowance, wadding, reinforce, right side, wrong side, hem  
Template, pattern pieces, names of textiles and fastenings used, pins, needles, thread, pinking shears, fastenings, iron transfer paper  
Annotate, functionality, innovation, authentic, user, purpose, evaluate, mock-up, prototype

#### Investigative and Evaluative Activities (IEAs)

- Children investigate and evaluate a range of existing textiles products and how they have been constructed using disassembly, and evaluate what the fabric shapes look like, how the parts have been joined, how the product has been strengthened and stiffened, what fastenings have been used and why.
  - Investigate work by designers and their impact on fabrics and products. Use questions to develop understanding e.g. *Is the product functional or decorative? Who would use this product? What is its purpose? What design decisions have been made? Do the textiles used match the intended purpose? How has it been made? What has been used to enhance the appearance? Is the design innovative?*
- Children investigate properties of textiles through investigation e.g. exploring insulating properties, water resistance, wear and strength of textiles.

#### Focused Tasks (FTs)

- Develop computer-aided design (CAD) skills by using pattern making software to generate, modify, scale, save and print pattern pieces. Recognise that designs can be easily modified and repeated on the computer without the need for a physical product. Investigate using art packages on the computer to design prints that can be applied to textiles using iron transfer paper.
  - Develop skills of 2-D paper pattern making using CAD and create a 3-D paper or Dipryl mock-up of a chosen product. Remind/teach how to pin a pattern on to fabric ensuring limited wastage, how to leave a seam allowance and use different cutting techniques.
  - Develop skills of threading needles and joining textiles using a range of stitches, building upon children's earlier experiences of stitches e.g. improving appearance and consistency of stitches and introducing new stitches. If available, demonstrate and allow children to use sewing machines to join fabric with close adult supervision.
  - Develop skills of sewing textiles by joining right side together and making seams. Children should investigate how to sew and shape curved edges by snipping seams, how to tack or attach wadding or stiffening and learn how to start and finish off a row of stitches.

#### Design, Make and Evaluate Assignment (DMEA)

- Set an authentic and meaningful design brief. Children generate ideas by carrying out research using surveys, interviews, questionnaires and the internet. Develop a design specification for their product.
  - Communicate ideas through detailed, annotated drawings from different perspectives. Drawings should indicate the design decisions made, methods of strengthening, the type of fabrics to be used and the types of stitching that will be incorporated.
  - Produce step-by-step plans, lists of tools equipment, fabrics and components needed. Allocate tasks within a team if appropriate.
  - Develop their design using CAD software to produce pattern pieces and art programmes to produce decoration and design prints that can be applied to textiles.
  - Make high quality products applying knowledge, understanding and skills from IEAs and FTs. Incorporate simple computer-aided manufacture (CAM) if appropriate e.g. printing on fabric. Use a range of techniques to ensure a well-finished final product that matches the intended user and purpose.
  - Evaluate both as the children proceed with their work and the final product in use, comparing the final product to the original design specification. Critically evaluate the quality of the design, the manufacture, functionality, innovation shown and fitness for intended user and purpose, considering others' opinions. Communicate the evaluation in various forms e.g. writing for a particular purpose, giving a well-structured oral evaluation, speaking clearly and fluently.