Years 5/6
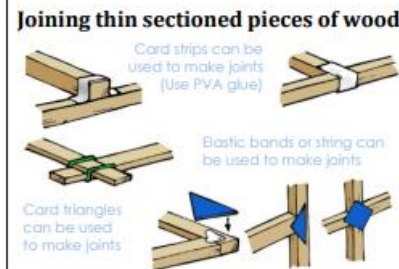
Structures
Frame structures

Instant CPD

Tips for teachers

- ✓ 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.
- ✓ Record the process of investigating frame structures using photographs and annotated drawings.
- ✓ Take children on a local 'frame structures' trail to help them get ideas for their own products and understand construction techniques.
- ✓ Frame structures for large scale shelters can be made from broom sticks, garden canes or rolls of newspaper.
- ✓ Ensure children are familiar with all the materials they are likely to use and that these are made easily available and accessible.
- ✓ Discuss constraints such as time, resources and cost.
- ✓ Display technical vocabulary and encourage children to use it when discussing, designing and making their product.
- ✓ Ensure children use simple tests to evaluate the functionality and strength of their products.
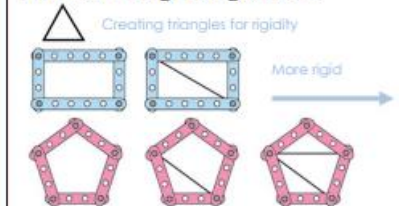- ✓ Encourage the children to evaluate each other's work positively.

Useful resources at www.data.org.uk

- · **Primary Subject Leaders' File Section 5.9**
- · **Bird Hides Design and Make Challenge**

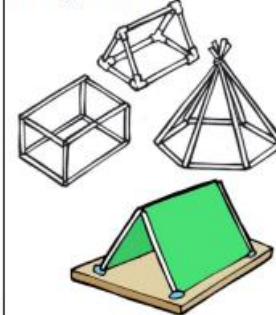## Techniques for building frame structures

Roll paper to make tubes for construction

Joining straws

Drinking straw

Plastic tubing

Threaded and tied

Pipe cleaner

Straws split to fit round then glued

Straw flattened, wrapped around and glued

Glued to card

Ends of straws flattened and glued

One straw creased and inserted

Flattened and glued

Pipe cleaner

Sleeve glued around joint

Sticky tape

Joining thin sectioned pieces of wood

Card strips can be used to make joints (Use PVA glue)

Elastic bands or string can be used to make joints

Card triangles can be used to make joints

Understanding triangulation

Creating triangles for rigidity

More rigid

Making small-scale frame structures

Using straws

Using square section wood

Card

Glue – use sparingly

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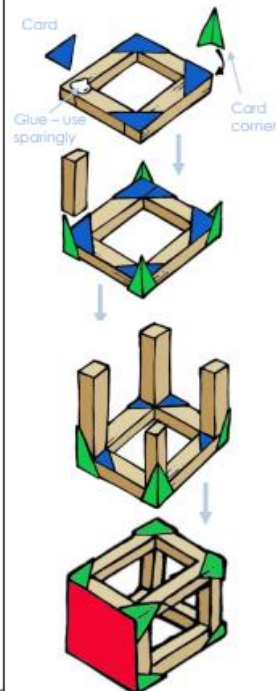
Designing and making a small-scale bird hide for children to use in the school wildlife area

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:

THOUGHT	ACTION
What type of structure shall I make? What will be its purpose? Who will use it?	Discussing ideas, drawing annotated sketches. Generating a simple design specification.
Which will be the best shape for my bird hide? What features will it have?	Discussing, modelling and evaluating different options.
Which materials will I use to make it? How will I make it strong and waterproof?	Investigating and testing possible materials. Discussing, exploring and evaluating prototypes.
What will I use to cover the structure of my shelter?	Discussing, exploring and evaluating different fabric and rigid covering options.
What tools and materials will I need? What order will I work in? Will I work with someone? What constraints I am working to?	Negotiating, developing and agreeing a step-by-step plan.
Do I need to change anything?	Discussing, testing and modifying the design.
Will my product meet the needs of the user?	Evaluating the product with the intended user and against the original design specification.

Glossary

- **Modelling** – the process of making a 3-D representation of a structure or product.
- **Compression** – the application of pressure to squeeze an object.
- **Strut** – a part of a structure under compression.
- **Tension** – a force pulling on a material or structure.
- **Tie** – a part of a structure under tension.
- **Diagonal** – a straight line that goes from one corner to another inside a shape.
- **Horizontal** – a line that is parallel to the ground.
- **Vertical** – a line that is at right angles to the ground.
- **Triangulation** – the use of triangular shapes to strengthen a structure.
- **Frame structure** – a structure made from thin components e.g. tent frame.

Instant CPD

Tips for teachers

✓ When rubbing in flour and fat, keep ingredients and hands cool.

✓ The purpose of kneading bread is to strengthen the gluten (the protein in grain such as wheat). It normally takes about 10-12 minutes by hand. When ready the dough will be smooth, elastic and hold its shape.

✓ When developing a product e.g. soup, that requires chopping and slicing of ingredients refer to the Y3/4 Food Project Planner.

✓ Limit the number of ingredients added to the basic recipe and discuss when is the best time to add the new or changed ingredient(s).

✓ Emphasise the importance of accurate weighing and measuring.

✓ Some supermarkets and bakeries will allow children to visit. This could be linked to an enterprise project with a class-based food company.

✓ Children could design packaging for their food products as part of work on structures linked to mathematics.

✓ Carry out a survey to find out which cultural/seasonal food products are preferred by family and friends.

✓ For homework, encourage children to grow edible plants such as herbs.

Useful resources at www.data.org.uk

· **Christmas Ginger Biscuits**
· **Willy Wonka's Fair Trade Cookies**
· **Making Bread using the Six Essentials**
· **Are you Teaching Food in Primary D&T?**
· **A to Z of D&T**
· **Make it Safe!**

Other useful web-based resources:
· **www.foodafactoflife.org.uk**

Possible products

Biscuits | Savoury scones | Savoury muffins

Possible techniques that children could use

Mixing to combine ingredients if making savoury muffins or scones | Rubbing in to mix fat and flour if making a yeast-based product | Kneading a bread dough

Sensory evaluation

When carrying out sensory evaluations of products and/or separate ingredients, begin with a whole class activity then use group work to develop ideas.

Example of a recording table:

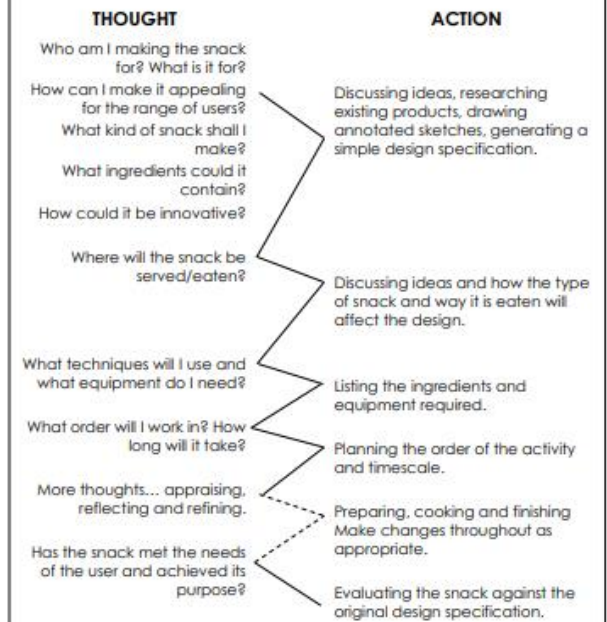| Type of cultural/seasonal food product	Appearance	Smell	Texture	Taste
Savoury scone	Golden/rough	Fresh/baked	Crumbly	Cheesy

Children can also use simple ranking and rating tables as well as star diagrams.

Use packaging and/or the internet to find out about the nutritional content of the food products and the ingredients. Link this to the principles of a healthy and varied diet.

Edible plants grown in the school grounds can also be evaluated and considered as potential ingredients for products the children will later design, make and evaluate. The benefits/difficulties of selecting seasonal, organic and/or locally sourced ingredients can be discussed here.

Designing, making and evaluating a yeast-based snack for parents and children participating in the school sports day

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

Who am I making the snack for? What is it for?

How can I make it appealing for the range of users?

What kind of snack shall I make?

What ingredients could it contain?

How could it be innovative?

Where will the snack be served/eaten?

What techniques will I use and what equipment do I need?

What order will I work in? How long will it take?

More thoughts... appraising, reflecting and refining.

Has the snack met the needs of the user and achieved its purpose?

ACTION

Discussing ideas, researching existing products, drawing annotated sketches, generating a simple design specification.

Discussing ideas and how the type of snack and way it is eaten will affect the design.

Listing the ingredients and equipment required.

Planning the order of the activity and timescale.

Preparing, cooking and finishing. Make changes throughout as appropriate.

Evaluating the snack against the original design specification.

Glossary

- **Finishing** – related to the appearance of the product – shape, decoration and colour.
- **Rubbing in** – rubbing the dry ingredients together with the fat, lifting to put air into the mixture, so that it resembles fine breadcrumbs.
- **Knead** – pulling and squeezing dough to make it smooth.
- **Bran** – the hard, protective shell of a grain of wheat.
- **Dough** – a mixture of flour, yeast and water before it is cooked.
- **Endosperm** – the store of food inside a seed.
- **Germ** – part of the seed where the root and shoots grow from.
- **Yeast** – a tiny plant which makes bubbles of carbon dioxide when mixed with flour and warm water.
- **Unleavened bread** – flat bread where yeast has not been added.

Years 5/6 | Electrical Systems
More complex switches and circuits

Instant CPD
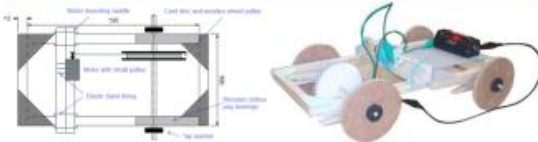
Tips for teachers

✓ To ensure progression from Y3/4, children need to develop an understanding of 'monitoring' as well as control and the idea of 'input' as well as 'output'.

✓ This project should be undertaken soon after electricity is covered in science and programming, monitoring and control are undertaken in computing.

✓ Create a selection of images of existing products e.g. burglar alarm and outdoor security lighting, that use monitoring and control.

✓ Discuss the difference between products that rely upon timed events, such as traffic lights, and those that depend upon monitoring to make something happen such as a security alarm.

✓ Some children will be ready to use parallel circuits in their electrical systems and this enables two or more sensors or switches to be incorporated in their products.

✓ Have a 'working' circuit set up so that children can test suspect components.

✓ Some components e.g. buzzers and light emitting diodes (LEDs) need to be connected the right way round in a circuit, ensuring positive and negative match the poles of the battery.

✓ Make sure electrical components and batteries match e.g. 1.5v bulb with a 1.5v battery.

✓ Do not use rechargeable batteries.

✓ CLEAPS recommend zinc carbon and zinc chloride batteries for Primary schools, not rechargeable, lithium of alkaline as these can overheat if short circuited. Button batteries are not recommended for younger children.

✓ Use non-mercury tilt switches.

Useful resources at www.data.org.uk

- **Torches, Lamps and Lanterns**
- **Alarming Vehicles**
- **Designing and making alarm circuits using inputs with computer control**

Switches and sensors

Latching switch

Micro-switch

Light-dependent resistor (LDR)

Push-to-make switch
When you push, the electricity flows through the circuit, but when you release it the circuit is broken and the switch is off.

Push-to-break switch
The switch is off while the button is pushed, but returns to its 'on' position when button is released.

- Micro-switch – a switch that can operate as push-to-break switch or a push-to-make switch.
- Push-to-break switch – a switch turned off by pressing it.
- Push-to-make switch – a switch turned on by pressing it.
- Reed switch – a switch operated by a magnet.
- Tilt switch – a switch that works when tilted at an angle.
- Toggle switch – a switch operated when a lever is pressed.
- Light dependent resistor (LDR) – a sensor that operates when light is shined on it.
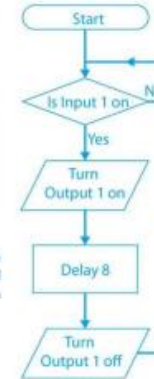
Reed switch
Activated by a magnet which closes the contacts.

Tilt switch
When tilted a ball bearing bridges the contacts inside, completing the circuit.

Standalone control box

Example control program

Interface control box

Start → Is Input 1 on → No / Yes → Turn Output 1 on → Delay 8 → Turn Output 1 off

- Children need to learn how to write a sequence of instructions where a decision is made e.g. when a switch is pressed a buzzer is activated.
- They use a 'control language' or create a flowchart to produce a series of instructions.
- Children's computing knowledge and skills need to focus on using input and output devices connected to a standalone box or interface box.
- They use their learning in computing to control and monitor products they have designed and made e.g. alarm system.

Designing, making and evaluating an alarm to protect a valuable artefact

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 will my alarm be for? What will it protect? Who will control it? What components will it need?	Developing innovative ideas through discussion and annotated sketches, generating a design specification.
Which switches or sensors should I use? What output devices should I use?	Discussing ideas, modelling possible electrical circuits. Recording design ideas pictorially or using circuit diagrams.
What tools and components will I need? What sequence of steps will I use?	Developing a step-by-step plan.
How can computer control improve my alarm system?	Writing and testing programs and connecting to a control box.
More thoughts… appraising, reflecting, refining.	More actions… assembling, testing, modifying.
Will the alarm achieve its purpose?	Evaluating the alarm against the original design specification.

Glossary

- **Modelling** – to realise and manipulate ideas in a tangible form.
- **Open switch** – when a switch is positioned such that electricity cannot flow through it.
- **Closed switch** – when a switch is positioned such that electricity can flow through it.
- **Normally open** – the term used to describe when a switch is in the off position, i.e. the switch is open and no electricity can flow when the button on not pressed.
- **Normally closed** – the term used to describe when a switch is in the on position i.e. the switch is closed and electricity can flow when the button is not pressed
- **Computer control input** – when a switch, such as a micro switch, sends a signal to a computer control box to activate a sequence of events such as a buzzer or light being used to attract attention or alert people.
- **Output devices** – components that produce an outcome e.g. bulbs and buzzers.
- **Input devices** – components that are used to control an electrical circuit e.g. switches or sensors.