

## Unit 8B(ii) Designing for clients

### Focus: resistant materials

#### About the unit

The main aim of this unit to develop pupils' designing skills and to teach them about designing for clients.

In this unit, pupils tackle a design and make assignment (DMA) on the theme 'Personal light source'. They develop a torch that uses a membrane switch and can be easily stored in a personal organiser. Their torch should carry promotional graphics and be of a basic design that can be varied or personalised for particular clients.

Pupils gain the knowledge, skills and understanding they need to carry out the DMA successfully through product evaluation activities and focused practical tasks. They:

- learn about batch production, including how to develop a basic design that can be varied or personalised for particular clients
- use manufacturing aids, *eg jigs, tools and templates*, to help with volume production
- learn that making identical parts in a batch can be cost effective and ensures accuracy

There are also opportunities for pupils to:

- use ICT to help design and make single items and small batches, when appropriate, and use spreadsheets to help them with costing and scaling up
- justify their decisions about materials and methods of making
- learn about the concepts of marketing, profit and loss
- find out about some of the tensions between production for profit and concerns about human development and welfare
- find out about the conflicting demands faced by designers and makers

#### Where the unit fits in

This is one of three resistant materials units that focus on designing: one in year 7 on designing for yourself; this one in year 8 on designing for clients; and one in year 9 on designing for markets. These units ensure progression in understanding about designing.

This is part of a series of three units in year 8 on designing for clients; there are equivalent units, with similar learning outcomes, on food and textiles. Together these units are expected to take 12–20 hours. It is important that the department plans as a team so that pupils are able to draw on knowledge, skills and understanding from across the units to reinforce their learning and avoid unnecessary repetition.

This unit could be linked to units on using ICT (units 7C, 8C).

If you choose not to teach this unit, then plan to include the essential activities identified by the symbol ■ as part of another unit.

If this unit is used later in year 8, then pupils should be able to complete more of the optional activities.

#### Expectations

##### At the end of this unit

**most pupils will:** carry out their own research using sources not provided by the teacher, and use their findings about existing products when developing their own ideas; make effective use of a range of strategies to generate design ideas, including using preliminary models to explore and test their thinking, and using formal drawing methods to communicate their intentions; use a range of techniques skilfully during trialling and production; work from detailed plans that they have produced, and modify these when appropriate; devise tests to evaluate the effectiveness of their product in use; evaluate how they have achieved their original design proposals and make recommendations for further development of the product

**some pupils will not have made so much progress and will:** carry out research on products that are produced commercially and use their findings when developing their own ideas; show some consideration of the needs or requirements of users; clarify their ideas through discussion and modelling, and give reasons for choosing between ideas; produce step-by-step plans and communicate alternative ideas; work safely and with some accuracy with a range of resources, avoiding risks, noting any hazards to themselves and others, and identifying ways of controlling risks; compare their product with the design specification and identify successful and weak parts of their work

**some pupils will have progressed further and will:** research users' views and the form and function of existing products, and use their findings about existing products when developing their own ideas; develop ideas that take into account the preferences and needs of users; show a good understanding of a range of making techniques, existing products, how their product could be produced to the required quantity and quality, and users' safety needs, when generating ideas; develop detailed criteria for their designs and use these to formulate design proposals; produce realistic and appropriate ideas to meet their specifications, noting sensible reasons for choosing between ideas; use a variety of media to communicate in some detail the planned making processes for the product; choose and use suitable criteria (including user opinion and practical testing) to evaluate the performance of their design ideas and their product in development, and implement suggested improvements

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## Prior learning

It is helpful if pupils have:

- used construction kit components to model ideas for parts of a product they would like to make
- selected appropriate tools, materials, components and techniques for a task, taking into account constraints, *eg time or the availability of resources*
- identified the main stages of making
- used appropriately a variety of temporary and permanent joining techniques
- used a range of cutting, shaping and forming processes, *eg sawing, line bending*
- used specified hand-tools to cut and form materials safely
- learnt the advantages and disadvantages of using ICT to develop and model designs
- used ICT when generating, developing, modelling and communicating design ideas
- used 2-D draw/paint software to produce accurate drawings and high-quality images
- recognised that all software programs have preset patterns and limitations
- accessed existing computer databases to look for information on materials and processes, *eg to research effectively*
- used spreadsheets for modelling, *eg costing materials or components*
- learnt how ICT can be used to plan making, inform the making process, or make products using CAM (computer-aided manufacture)

Pupils should have gained the above knowledge, skills and understanding in years 6, 7 and 8, through unit 6C ‘Fairground’, unit 6D ‘Controllable vehicles’ and unit 6A ‘Shelters’ in the key stage 2 scheme of work, unit 7B(ii) ‘Designing and making for yourself (resistant materials)’, unit 7C ‘Using ICT to support researching and designing’ and unit 8C ‘Using ICT to support making’, or similar projects.

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## Language for learning

Through the activities in this unit, pupils will be able to understand, use and spell correctly words relating to:

- designing, *eg variations, personalisation, marketing, profit, loss, conflict, users, opinion, generating ideas, models, trialling, proposals, specification, spreadsheet*
- making, *eg batch production, manufacturing aids, jigs, moulds, templates, quality, accuracy, identical, performance, production, scaling up*

Writing – through the activities pupils could:

- show relationships between ideas by links which show purpose, *eg in order to, so that*, and reservation, *eg although, unless, if*
- use punctuation correctly, *eg full stops, commas, dashes, brackets, bullet points, colons*, to extend and clarify sentences

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## Resources

Resources include:

- examples or photographs/pictures of light sources, *eg used for a number of different purposes and aimed at different users*, for product evaluation activities
- useful websites, *eg*
  - [www.tep.org.uk](http://www.tep.org.uk)
  - [www.design-council.org.uk](http://www.design-council.org.uk)
  - [www.howstuffworks.com](http://www.howstuffworks.com)
  - *manufacturers’ websites such as* [www.jjengineering.co.uk](http://www.jjengineering.co.uk); [www.ptc.com](http://www.ptc.com); [www.technologyindex.com/education](http://www.technologyindex.com/education)

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## Future learning

Pupils could go on to further units on designing, in particular unit 9B(ii) ‘Designing for markets (resistant materials)’.

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## Out-of-school activities and homework

Pupils could:

- identify a product that is either made locally or is famous, and imagine that they have been asked to develop a new version. They could record the key characteristics that they should keep in the new product and then record some ideas for a new version
- collect examples or pictures/photographs of limited edition varieties, new pack sizes, and new and improved varieties that have been created to prevent a drop in sales of a familiar product
- stop and think when next using a tool or a piece of equipment, cleaning their teeth or carrying out any other everyday activity, and record
  - *What are they doing?*
  - *What tools and equipment are they using?*
  - *How are they using the tools and equipment?*
  - *Could the tools and equipment be made to do this job better?*
  - *How could the tools and equipment be improved?*
  - *Would these improvements benefit only them, or other people as well?*
- discuss with older members of their family how a product has changed since they were young, *eg pens, bicycles, signs, clocks, telephones, radios*

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## Links with other subjects

- Mathematics: finding and evaluating data.
- PSHE: looking at real-life situations, personal preferences and priorities.

**Learning objectives**

Pupils should learn:

**Possible teaching activities****Learning outcomes**

Pupils:

**Points to note****DESIGN AND MAKE ASSIGNMENT (DMA)**

- to design a product suitable for manufacturing and explore how it could be produced as a batch or single item, using CAD/CAM (computer-aided design and manufacture) when appropriate, by applying the knowledge, skills and understanding they developed during the product evaluation activities and focused practical tasks

Set the pupils a DMA in which they design a product that can be manufactured in batch or as a single item. The emphasis of the assignment should be on designing skills. Pupils should develop a basic design that can be varied or personalised for particular clients on the same production line, working through conflicting demands they face as a designer and maker. The assignment should require them to justify their decisions about materials and methods of making.

**Example**

This example DMA has been written so it can be copied and given directly to pupils. Further details and contexts can be added, as appropriate.

**Personal light source**

New batteries and bulbs make it possible to design and make slim versions of torches. Using appropriate materials, *eg card, sheet plastic, suitable components*, design and make a torch that has a membrane switch. The torch should be small enough to store in a personal organiser and carry promotional graphics for a commercial manufacturer or user.

- formulate a design specification, bearing in mind the social, cultural and environmental contexts and having talked to users
- identify the critical factors that should be used as design criteria, including those relating to social and environmental issues
- decide which design criteria clash and which should take priority
- find out which materials are available and use technical data to decide on their suitability for the task
- develop systems for ensuring quality when planning batch production
- take steps needed to control identified risks
- discuss with users the extent to which the product meets the design criteria



**Health and safety** – pupils should be taught about the possible hazards when some components are damaged, *eg flat-pack batteries*, and how to control the risk of accidents

**Use of ICT**

- Pupils could use ICT to draw ideas and model in 2-D and 3-D, creating realistic representations of the finished torch. This links to activities/tasks in unit 7C 'Using ICT to support researching and designing'.

**PRODUCT EVALUATION**

- Organise a range of activities that give pupils an opportunity to:
- learn how products are made in different historical and cultural contexts
  - understand how and why products have changed over time
  - distinguish between the quality of the design and the quality of manufacture
  - learn to record thoughts, design ideas and explorations

■ essential activities

○ optional activities

**Learning objectives**

Pupils should learn:

- the main techniques that designers use to generate ideas

- how designers use sketchbooks and folios to record thoughts and design explorations

- how existing products are adapted to extend a product life cycle, and to appreciate the conflicting demands on designers and makers

**Possible teaching activities**

- Organise a class debate on the subject 'Where do new design ideas come from?' If possible, use information from designers and older pupils on how their ideas emerged.

Discuss, and allow the pupils to try out, strategies for generating new ideas, eg

- brainstorming
- word extension
- analysing products
- using part of a visual image (window search)
- taking everyday objects and thinking up new uses for them (including outrageous ideas)
- visiting places
- talking to people
- using the work of a design movement or work from other times and cultures
- instant modelling with a variety of materials
- experimenting with materials and processes
- observing changes as a result of fashion trends and lifestyle shifts
- collecting images that inspire
- reviewing films
- going to exhibitions and galleries

- Present the pupils with the quotation '*... good design is a hit or miss process, with many false starts, abandoned ideas and failed explorations. In many ways, the journey is as significant as the destination*' (Nick Butcher, design director, Rodney Fitch and Co). Describe to the pupils how designers record their thoughts, design ideas and explorations, eg *how they use sketchbooks, moodboards, collages, drawings, collections of inspiring photographs and postcards*. Show the pupils good and poor examples of recording and explain that they will need to choose the best methods for their own design work.

- Look at familiar products with the pupils, eg *light sources*. Discuss the idea of a product life cycle and consider how manufacturers often produce limited edition varieties, new pack sizes, and new and improved varieties to prevent a drop in sales and extend product life. As part of this discussion, pupils could be asked
  - *What are the special features?*
  - *What makes a product unique or new?*
  - *Who is the new product aimed at?*
 Ask the pupils to collect as many examples or pictures of these as they can.

**Learning outcomes**

Pupils:

- use at least two strategies to generate design ideas, eg *brainstorming, analysing products, visiting places*, and explain why they use them

- produce their own sketchbook and folio of source material, and show that they understand conventions for selecting and recording sources of ideas and inspiration. They should recognise that this is an important part of developing their own ideas

- explain what is meant by product life cycle, marketing, and profit and loss
- describe the main stages of the product life cycle and how to extend the life of a familiar product

**Points to note**

■ essential activities

○ optional activities

Pupils should learn:

Pupils:

### FOCUSED PRACTICAL TASKS (FPTs)

These practical tasks should focus on the knowledge, skills and understanding outlined in 'About the unit'. They should give pupils an opportunity to practise any new skills they will need during the DMA, *eg to help pupils understand designing for batch production.*

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|---|--|--|
| <ul style="list-style-type: none"> <li>■ how suitable components can be used to produce an appropriate and effective circuit</li> </ul>   | <ul style="list-style-type: none"> <li>■ Provide opportunities for the pupils to learn how to incorporate a membrane switch in a simple circuit.</li> </ul>  | <ul style="list-style-type: none"> <li>■ make a working circuit</li> </ul>   |
| <ul style="list-style-type: none"> <li>■ that promotional graphics should be concise and visually stimulating</li> </ul>  | <ul style="list-style-type: none"> <li>■ Show the pupils graphic techniques and explain visual principles, then give them an opportunity to draw graphic images.</li> </ul>  | <ul style="list-style-type: none"> <li>■ produce a graphic message or image</li> </ul>   |
| <ul style="list-style-type: none"> <li>■ that batch production is a method of making a small quantity of identical products, and can be used to produce variations on a theme</li> </ul>  | <ul style="list-style-type: none"> <li>■ Explain to the pupils the batch-production methods in commercial production, including how to develop a basic design that can be varied or personalised for particular clients. Ask the pupils to develop their own basic design for a product with variations, <i>eg decorations and finishing</i>, for different users. Ask the pupils to produce a flow chart for their product and the variations.</li> </ul>           | <ul style="list-style-type: none"> <li>■ explain what is meant by 'batch production' and produce a flow chart to show how to batch-produce a basic design that can be varied</li> </ul>        |
| <ul style="list-style-type: none"> <li>■ that manufacturing aids, <i>eg jigs, templates, moulds</i>, ensure accuracy and help with volume production, and that designers use standard components and sizes to make production easier</li> </ul> | <ul style="list-style-type: none"> <li>■ Show the pupils examples of how manufacturing aids, <i>eg jigs, tools, moulds, templates</i>, can be made or used to help with volume production. Discuss with the pupils how they should take into account the use of manufacturing aids when designing. Discuss how designing and making identical parts in a batch, using CAD/CAM or other manufacturing aids, can be cost effective and can ensure accuracy.</li> </ul> | <ul style="list-style-type: none"> <li>■ use appropriate manufacturing aids to ensure that all parts of products are identical when a number of the same item are designed and made</li> </ul> |
| <ul style="list-style-type: none"> <li>○ that ICT can be used to design and make a batch of identical parts easily, and how to use ICT to scale up production plans and work out costs</li> </ul>   | <ul style="list-style-type: none"> <li>○ Demonstrate to the pupils how ICT can help them to design and make single and batch-produced items, and discuss when it is appropriate to use ICT, <i>eg using spreadsheets to help with 'scaling up' or costing, using CNC machines.</i></li> </ul>  | <ul style="list-style-type: none"> <li>○ describe how to use ICT to design and make a batch of identical parts, and to scale up and cost production</li> </ul>                                 |

#### Use of ICT

- Pupils could:
    - use a CNC (computer numerically controlled) machine to make a batch of identical parts
    - use a draw/paint program to produce graphics to apply to the torch surface
    - use a draw/paint program or CAD (computer aided design) software to make a stencil that can be used to transfer a design to the surface of the torch
- These link to activities/tasks in unit 8C 'Using ICT to support making'.

■ essential activities

○ optional activities

**Learning objectives**

Pupils should learn:

- how to use a variety of CAD software and computer-controlled machines safely as part of their designing and making, to encourage them to become familiar with, and positive users of, ICT

**Possible teaching activities**

- Demonstrate to the pupils how they can use CAD software and computer-controlled machines to design and make items, eg
  - *how to use ICT to draw ideas and model in 2-D and 3-D*
  - *how 3-D modelling software can create realistic representations of a finished product, such as a light source cover*
  - *how to use 2-D draw/paint programs to produce images, such as promotional graphics, to apply to the surface of products*
  - *how to use 2-D draw/paint programs to produce a pattern or template that can be printed out to help ensure accurate making, such as a pattern or template showing the position of holes to be drilled*
  - *how to transfer CAD-printed designs to other materials, such as printed circuit boards*
  - *how to use draw/paint programs or CAD software to make a stencil that can be used to transfer a design to a product and then reused*
  - *how to use plotter/cutters to produce full-size patterns or templates in thin sheet material*
  - *how to use CAD software and CNC machines to design and make products, such as a vinyl cutter to design and make shapes*

Advise the pupils on safety and technical issues. Give the pupils an opportunity to practise these skills by making simple items, eg a key fob, name plate, simple container, personal adornment.

**Learning outcomes**

Pupils:

- use CAD software and follow instructions to set up a computer-controlled machine
- use machinery safely to make a simple item, eg a template
- explain why it might be appropriate to use CAD/CAM rather than hand-tools

**Points to note**