

Unit 8E(ii) Producing batches

Focus: resistant materials

About the unit

The main aim of this unit is for pupils to learn how to make and produce their work in quantity.

In this unit, pupils tackle a design and make assignment (DMA) on the theme ‘Sheet materials’, in which they develop a product made from a single sheet of material that is suitable for batch production. They should choose an appropriate method of making the products, and manufacture them with precision, observing health and safety regulations and taking action to control identified risks.

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

- use processes, tools, equipment and techniques to make with some precision, showing that they understand their uses
- revise and consolidate their understanding of health and safety regulations
- take account of the technical requirements needed to make a product
- use manufacturing aids to ensure accuracy and aid volume production

There are also opportunities for pupils to:

- justify their decisions about the selection of materials and methods of making, recognising the global dimensions of life-cycle analysis
- find out what materials are available and use technical data to decide on their suitability for a task
- understand the difference between the management of renewable energy sources and the need for energy conservation

Where the unit fits in

This is one of three resistant materials units that focus on making and producing: one in year 7 on designing and making for yourself (unit 7B(ii)); this one in year 8 on producing batches; and one in year 9 on ensuring quality production (unit 9E(ii)). These units ensure progression in understanding about making and producing in quantity.

This is part of a series of three units in year 8 on producing batches; 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 can be combined with unit 8B ‘Designing for clients’ or unit 8C ‘Using ICT to support making’, and taught as one unit. Teachers can choose to teach the DMA from either unit, as long as the objectives of both units are met.

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 and use their findings about products that are produced commercially when developing their own ideas; consider the needs of users and any manufacturing constraints; clarify their ideas through discussion, drawing and modelling; give reasons for choosing between ideas; draft a plan for making and show alternative methods, if necessary; work safely and accurately when using a range of resources, avoiding risks, explaining fully any hazards to themselves and others, and identifying ways of controlling risks; try out and test ways of making and finishing their product and explain their choices; use relevant techniques skilfully during production, including measuring, marking out, cutting, forming, joining and finishing; set up tests to evaluate the effectiveness of their product in use; compare their product with the design specification and identify successful, weak or problematic parts of their work

some pupils will not have made so much progress and will: carry out research and use their findings when developing their ideas; choose between available materials, tools, equipment and techniques and explain their choices; suggest the next steps for planning and constructing their product; measure, mark out and cut various materials reasonably accurately and safely during production, noting safety equipment used and its purpose; identify successful, weak or problematic parts of their work

some pupils will have progressed further and 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 preliminary models to explore and test their thinking, and use formal drawing methods to communicate their intentions; use a wide range of techniques skilfully during trialling and production, including measuring, marking out, cutting, forming, joining and finishing; devise tests to evaluate the effectiveness of their product in use; evaluate and demonstrate how they have achieved their original design proposals and make recommendations for further development of the product

Prior learning

It is helpful if pupils have:

- used construction kit components to model ideas for parts of a product
- 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
- learnt that a pattern/template can be used many times and that this ensures consistency in size
- learnt that ideas for products can be developed by modelling with paper or scrap material
- worked independently and systematically using a step-by-step plan, *eg a flow chart*, to sequence their work
- used appropriately a variety of temporary and permanent joining techniques
- used a range of cutting, shaping and forming processes
- used specified hand-tools to cut and form materials safely
- 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’, unit 6B ‘Slippers’ and unit 6A ‘Shelters’ in the key stage 2 scheme of work, unit 7B(ii) ‘Designing and making for yourself (resistant materials)’ and unit 8C ‘Using ICT to support making’, or similar projects.

Language for learning

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

- designing, *eg health and safety regulations, compare, users, performance, trialling, proposals, specification, criteria*
- making, *eg control, techniques, manufacturing aids, jigs, moulds, templates, quality, accuracy, identical, production, batch production, decoration*

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

Resources

Resources include:

- a variety of materials, tools and equipment to practise manufacturing techniques
- useful websites, *eg*
 - www.sony.co.uk
 - www.generalpattern.com
 - www.create.org.uk
 - www.incpen.org

Future learning

Pupils could go on to unit 9E(ii) ‘Ensuring quality production (resistant materials)’.

Out-of-school activities and homework

Pupils could:

- practise techniques for finding out about users they know nothing about, *eg looking at the situation in which a product will be used, talking to users*, to establish what people like and dislike and the range of people who will use the product
- describe the design, production, promotion, use and disposal of one product. *What or whose needs or wants might have been considered during each stage from design to disposal? How might they have been identified? Who might have been consulted? How might the design have been developed? What alternatives were considered? Who or what influenced decisions?*
- list the criteria that a manufacturer might have thought about when making an existing product, *eg CD storage*
- draw any new tools and pieces of equipment they have used and label their drawings. They could write a short guide on how to use the tools and equipment safely
- produce a flow chart to plan the production of a simple item or part of an item. Pupils can be given the main stages and asked to put them in the correct order. They should add notes to show that they have considered the safest way of working and the precautions they would take

Links with other subjects

- ICT: product evaluation activities can be linked to year 7 unit 2 ‘Information and presentation’.
- Mathematics: quantitative data, collecting and interpreting data.
- English: drawing up a specification, writing report(s).
- Geography: recognising the global dimensions of life-cycle analysis.
- Sustainable development: paying attention to the sources of materials and the consequent pressures on the earth’s natural cycles and resources.

Learning objectives

Pupils should learn:

Possible teaching activities**Learning outcomes**

Pupils:

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

- to manufacture a product with precision, choosing suitable materials and an appropriate method of making, and to observe health and safety regulations, 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 manufacture a product with precision, observing health and safety regulations, and taking action to control identified risks. They should be required to use technical data to decide which materials are suitable for the task and to choose an appropriate method 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.

Sheet materials

Many products are made from a single sheet of material, *eg flat sheets can be folded to form a 3-D shape to make furniture, containers or packaging*. Objects made from folded sheet(s) can be very light and rigid, and folding flat sheets to form a 3-D object can be more economical in production than joining separate sections. Complicated shapes can be modelled in card or on computer screens. Design and make a product that is mainly made from a single sheet of material. Your product should be aimed at the young teenage market and be easily batch-produced.

- put together a design specification
- produce a product within constraints
- develop a system to ensure quality
- use a sequence of drawings or notes to clarify and communicate detail before making
- bring together resources at the right time
- use tools, equipment and techniques to make a product with precision
- justify their decisions about materials and methods of making a product

PRODUCT EVALUATION

Organise a range of activities that give pupils an opportunity to:

- discuss the needs of users and the extent to which a product meets the design criteria

- that products are designed to meet particular consumer needs and are also influenced by manufacturing constraints
- how to judge the extent to which products meet people's needs
- Product development should respond to the needs and demands of consumers in order to maintain sales, *eg meeting the demand for products that are environmentally friendly*. Discuss with the pupils which products have been made recently to meet consumer needs, *eg ask the pupils to consider What has caused the demand for these products, such as changing lifestyles?* Discuss what demands there might be in the future for products, *eg ask the pupils to consider What might different groups of people want or need?*
- describe how a product design is influenced by manufacturing constraints, *eg reducing the number of parts for ease of assembly*
- describe the need for a product and judge how well it meets that need

■ essential activities

○ optional activities

Learning objectives

Pupils should learn:

- to consider how the extraction, use and eventual disposal of some materials used in high-volume manufacturing affect the natural environment and human health

Possible teaching activities

- Ask the pupils to carry out research to discover how extracting, producing and transporting one of the materials used affect the natural environment and human health. Discuss how the impact on the environment can be minimised when manufacturing products.

Learning outcomes

Pupils:

- recognise that choosing the best materials for a job may not simply mean choosing the materials most appropriate for the manufacturing requirements
- know that it is important to consider recycling, reusing and reducing the amount of materials when manufacturing a new product

Points to note**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 how to use techniques, tools, equipment and processes*.

- how to use a range of cutting and shaping processes, *eg sawing*, and to use specified hand-tools to cut and shape specific materials safely

- In order to review progress, reinforce year 7 work and to prepare for the DMA, ask the pupils to practise a variety of cutting, joining and shaping processes in resistant materials.

For example, the pupils could:

- *mark out across materials and along materials, eg to mark plywood using a try square and sharp pencil, to mark along material with a marking gauge or odd leg callipers*
- *saw straight lines by hand, using a bench hook and backsaw or a vice and hacksaw*
- *saw curved lines, using a coping saw, abrafile or fretsaw*
- *cut aluminium using tin snips*
- *use permanent joining techniques, eg glues, rivets, heat processes*
- *use temporary joining techniques, eg screws, nuts and bolts*

Pupils should revise relevant health and safety regulations and, where appropriate, they should test and compare different tools and pieces of equipment for the same task.

Pupils could practise their skills by making a simple item from a design or plan they are given, *eg a key fob, an aluminium dish, laminated jewellery, a coat hook*.

- select and use specified hand-tools to cut, join and shape specific materials safely and accurately
- compare different tools and pieces of equipment for the same task and select the most appropriate or effective for the task
- explain how they have carried out a risk assessment and taken action to control identified risks



Health and safety – pupils should be reminded about hazards, risks and risk control when using all tools and equipment. They should be asked to explain how they are managing their workspace to ensure the health and safety of themselves and others, and to explain the steps they have taken to control risks. They should also be reminded how to use information on tools, equipment and materials to assess immediate and cumulative risks

Language for learning when planning making

- Ask pupils to write instructions for making their product, concentrating on correct terms and punctuation to achieve accuracy. Production plans, instructions and annotations all demand precision and clarity to be effective. Pupils could assess the accuracy of their instructions as they or others use them. Conventions for laying out and recording plans, *eg lists of tools and equipment, verbs for processes, correct punctuation*, should be shared with pupils.

■ essential activities

○ optional activities

Learning objectives

Pupils should learn:

- that manufacturing aids, *eg jigs, templates, moulds*, ensure accuracy and help with volume production, and that manufacturers use standard components and sizes to make production easier
- that CAD/CAM or other manufacturing aids can be used to make a batch of identical parts easily
- how to use a variety of 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

- Show the pupils examples of how manufacturing aids, *eg jigs, tools, moulds, templates*, can be made or used to help with volume production. Discuss with them how they should take into account the use of manufacturing aids when making. Discuss how designing and making identical parts in a batch, using CAD/CAM (computer-aided design and manufacture) or other manufacturing aids, can be cost effective and ensure accuracy.
- Discuss with the pupils how identical parts can be made using CAD/CAM or other manufacturing aids.
- Revise or demonstrate to the pupils how to use CAD/CAM for making single items and for small batch production, and discuss when it is appropriate to use ICT. Discuss with the pupils the use of computer-controlled machines to realise designs, including safety points and technical advice. Allow the pupils to practise their skills by making a simple product, identified by the teacher. Make sure that the pupils have an opportunity to practise the skills they will need during the DMA, *eg*
 - *using a 2-D draw/paint program to produce images to apply on to the surface of products*
 - *using a 2-D draw/paint program to produce a pattern or template that can be printed out to help ensure accurate making, such as a pattern or template to show the position of holes to be drilled*
 - *using a computer-controlled machine to cut standard shapes to form part of the pieces of a 'slot-together product'*

Learning outcomes

Pupils:

- use appropriate manufacturing aids to ensure that all parts of products are identical when several of the same item are made
- know how CAD/CAM or other manufacturing aids can be used to make a batch of identical parts
- follow instructions to set up a computer-controlled machine, use it safely to make a simple item, *eg a template*, and explain why it might be appropriate to use CAD/CAM

Points to note

■ essential activities

○ optional activities