Unit 9B(iii) Designing for markets

Focus: textiles

About the unit

The main aim of this unit is for pupils to learn about designing for manufacturing and the main commercial processes that are used by manufacturers. The emphasis is on thinking about how a product will be made as an integral part of the design process, rather than as an afterthought once the design is complete.

In this unit, pupils tackle one of two design and make assignments (DMAs) on the themes 'Mini-enterprise' and 'Designer–makers'.

The same DMAs are used for the units on food and resistant materials, and are all set in the context of a mini-enterprise or school/craft fair. Pupils work as a team to design and make a product, identifying different roles for team members.

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

- design a product that is suitable for manufacture in volume
- learn how manufacturers generate and develop new ideas for products, *eg through lifestyle research, making samples*
- learn what is meant by 'one-off' and 'high-volume' production
- find out about the main commercial manufacturing processes
- learn how quality assurance systems, *eg inspection and testing, using templates*, are used during the design stage to plan safe and accurate production
- learn how ICT influences designing and manufacturing in industry, and how computer-controlled systems are used in industry and commerce
- explore how repetitive quality can be assured with CAM (computer-aided manufacture)
- learn that users often place a different value on hand-made products and products designed and produced in high volume

Where the unit fits in

This is one of three textiles units that focus on designing: one in year 7 on designing for yourself; one in year 8 on designing for clients; and this 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 9 on designing for markets; there are equivalent units, with similar learning outcomes, on food and resistant materials. Together these units are expected to take 10–15 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. However, you can teach this unit by focusing on just textiles.

This unit could be linked to units on using ICT (units 7C, 8C, 9C).

This unit could be taught as one unit with unit 9E(iii) 'Ensuring quality production (textiles)'. It could be used as an end-of-key-stage 3 assessment task, and some of the optional activities are suitable for later in year 9.

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

Expectations

At the end of this unit

most pupils will: give reasons for their choice of role within a team; link the development of a product to users' needs and explain any changes to the design proposal; make effective use of a range of strategies to generate design ideas, including modelling to explore and test their thinking; use a range of techniques skilfully during trialling and production; work from detailed plans that they have produced; adapt their methods of manufacture to changing circumstances that batch or volume production requires; understand the importance of quality assurance and control; 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: explain why different roles are needed in a team; identify some users' needs; clarify their ideas through discussion and modelling and give reasons for choosing between ideas; produce a step-by-step plan and communicate alternative ideas; work safely and with some accuracy with a range of resources; show an awareness of quality assurance and control; compare their product with the design specification and identify successful and weak parts of their work

some pupils will have progressed further and will: describe accurately how team members can be organised to suit their skills and abilities; identify a product to be made; show a good understanding of how their product could be produced in the required quantity and to the required 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

■ essential activities ○ optional activities

reasons for choosing their ideas; communicate in some detail the planned making processes; explain how quality control and assurance procedures were developed and applied; record judgements about quality assurance; 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

Prior learning

It is helpful if pupils have:

- learnt about batch production, including how to develop a basic design that can be varied or personalised for particular clients
- used ICT to help design and make single items and small batches, when appropriate, and used spreadsheets to help them with costing and scaling up
- used manufacturing aids, *eg tools and templates/patterns,* to help with volume production
- learnt that making identical parts in a batch is cost effective and ensures accuracy

Pupils should have gained the above knowledge, skills and understanding in year 8 through unit 8B(iii) 'Designing for clients (textiles)', 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 for markets, *eg business, marketing, manager, mini-enterprise, teamwork, roles, responsibility, entrepreneur, entrepreneurial, impact, environment, profit, cost, user research, product research, new product development*
- manufacture, *eg manufacturer, factory, quality assurance, quality control, flow chart, one-off, high volume, CAD, computer-aided design, CAM, computer-aided manufacture, template, production line, production cell*

Speaking and listening – through the activities pupils could:

- solve a problem, consider alternatives, structure plans and organise group activity

Writing – through the activities pupils could:

- understand the effect of different aspects of formality, *eg passive verbs, third person, abstract nouns*

Resources

Resources include:

- the local education business partnership to find out about resources and local contacts
- CAD/CAM (computer-aided design and manufacture) equipment, *eg computers and software to drive sewing machines, an embroiderer, plotter*
- useful websites, *eg*
  - *www.dotline.org*
  - *www.cant.ac.uk/mbd*
  - *www.design-council.org.uk*

Future learning

Pupils could go on to further work in year 9 (unit 9E 'Ensuring quality production' and unit 9C 'Using ICT to link with the world outside school'), and use their knowledge, skills and understanding further in key stage 4.

During key stage 4, pupils will learn to:

1a) develop and use design briefs, detailed specifications and criteria
1b) consider issues that affect their planning
1c) design for manufacturing in quantity
1d) produce and use detailed working schedules, setting realistic deadlines and identifying critical points
1g) use graphic techniques and ICT, including CAD (computer-aided design), to generate, develop, model and communicate design proposals

(Extracts from the D&T key stage 4 programme of study)

Out-of-school activities and homework

Pupils could:

- investigate the structure of a local manufacturing company, *eg after a class visit or after watching a video*
- carry out market research and testing for the product that they are designing (during the design and make assignment)
- draw up a flow chart showing the production plan for a product
- carry out a product analysis of existing products that are similar to the one they are designing
- evaluate their role in the team (after the design and make assignment)
- prepare some marketing material for their product

Links with other subjects

- ICT: using a range of ICT applications, using CAD/CAM, exploring the influence of ICT on the manufacturing industry and commerce.
- English: producing plans.

Learning objectives Pupils should learn:	Possible teaching activities	Learning outcomes Pupils:	Points to note

DESIGN AND MAKE ASSIGNMENT (DMA)

- to work successfully as a team to design for high-volume manufacturing, 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:
- think about how designing for high-volume manufacturing brings new considerations and constraints for a designer
- identify the need for a product and a group of people who might use it
- identify roles for their team members, perhaps setting up a mini-enterprise to make the product in volume
- design a product that users want
- develop and make prototypes of the product, to ensure that it can be manufactured easily
- make the product efficiently and ensure high quality

Examples

These example DMAs have been written so they can be copied and given directly to pupils. However, a more specific context and background information should be added so that the DMAs are appropriate for your pupils.

Mini-enterprise

Identify the need for a new product and think about the group of people who might use it. Design and manufacture the product in volume, making sufficient quantities to meet expected demand.

Designer–makers

Design and make a simple product to sell at a craft fair. The product must be suitable for batch production. Your design and any decoration need to be simple, so that it is easy to manufacture.

- select information sources, deciding which will help them with ideas for their design
- seek the opinions of potential users of the product and others who might be affected
- consider the impact of a solution on users when drawing up a design brief
- refine a single idea from a range of ideas and draw up a manufacturing specification
- model different shapes, forms and colourways in 2-D and 3-D, using ICT where appropriate
- resolve conflicting demands when proposing design ideas
- consider whether a product is marketable, maintainable and sustainable when generating ideas
- use a range of ICT applications in an integrated way to help them generate ideas
- produce plans that predict the time needed to carry out the main stages of making
- use CAD/CAM, where appropriate
- collate, interpret and present product information to a client
- review the extent to which the product meets the design specification at appropriate stages of the development
- work effectively within a team, discussing and responding to information, working on designing and making aspects, and reviewing product outcomes

⚠ **Health and safety** – if products are made to be sold, then teachers must ensure that the relevant safety procedures are followed

Use of ICT
- Pupils could:
  - use ICT to draw ideas and to model in 2-D and 3-D, creating realistic representations of the finished product
  - work collaboratively, using conferencing or e-mail

These link to activities/tasks in unit 7C 'Using ICT to support researching and designing' and unit 9C 'Using ICT to link with the world outside school'.

■ essential activities ○ optional activities

Learning objectives Pupils should learn:	Possible teaching activities	Learning outcomes Pupils:	Points to note
PRODUCT EVALUATION			
	Organise a range of activities that give pupils an opportunity to: – formulate criteria and use these to comment critically on the product's impact on society, the extent to which it meets a need, its purpose and resource limits – explore why users place a different value on hand-made products and products made in high volume		
■ about the scale of new product development and the criteria that can be used to judge and compare new products, *eg how far they meet needs; their social, economic and environmental impact*	■ Ask the pupils to find out how many new types of a particular textile product are developed, *eg fashion accessories, bags, car interiors.* Discuss how long products survive before being replaced by a new or improved version. Ask the pupils to review one product that has been introduced recently, to discuss the need it was designed to meet, and to consider how far it meets those needs and its impact on society.	■ give three reasons why there are so many new products, explain why some of these products fail or are replaced regularly, and use simple criteria to compare products	**Use of ICT** • Pupils could use ICT to access information from experts outside the school via e-mail or fax. This links to activities/tasks in unit 9C 'Using ICT to link with the world outside school'.
■ how different products are made as a one-off or in high volume	■ Talk to the pupils about how well particular products are suited to manufacture in large volume. Discuss how different products are made in different ways, *eg large numbers of identical sweaters can be made using knitting machines, or a single jumper may be made by hand by an individual*	■ describe one or two differences between a one-off and a high-volume product, and give four examples of one-off products and four examples of high-volume products	
■ how to compare one-off and high-volume products	■ Ask the pupils to compare hand-made and high-volume products using these questions – *How is the product designed so that it is suitable for low-volume or high-volume production?* – *What are the costs of the materials, labour, tools and equipment needed to make the product?* – *Are the tools and equipment used to make the product specialised or general purpose?* – *Who determines the quality of the finished product? How is the level of quality maintained?*	■ compare one-off and high-volume products in terms of differences, *eg design features, cost, tools and equipment used, quality*	

■ essential activities ○ optional activities

Learning objectives Pupils should learn:	Possible teaching activities	Learning outcomes Pupils:
■ how local manufacturing has changed over time	■ A century ago, most manufacturing took place where there was a local supply of raw materials and people with the necessary skills. Ask the pupils to find out what products were produced in the local area, where the resources came from, and where the products went to. Ask the pupils and discuss with them why many companies are international and have factories in different countries.	■ describe manufacturing in the local area a century ago, and explain how it has changed since
■ how ICT influences manufacturing in industry and how computer-controlled systems are used in industry and commerce	■ Visit a local company to see how a product is designed and manufactured and how ICT influences manufacturing in industry. If a visit to a local company cannot be arranged, pupils could watch a video or slide show, or go on a virtual visit using the internet site of a manufacturer.	■ talk about how a local company produces a product, *eg what it makes, the materials, tools and equipment that it uses, including ICT*
○ about local manufacturing industries and businesses, and how they combine business skills with designing skills	○ Ask the pupils – *What products are made in the local area?* – *Do you know anyone involved in manufacturing?* – *What do they do?* Ask a speaker, *eg a local company manager, a small business unit manager, an ex-pupil who now runs a successful local business*, to give the pupils advice on running a business.	○ name one product that is made in the local area and give the name of the company that makes it; describe the structure of the company and the roles of people who work there
○ that designers and manufacturers have to take into account resources, waste disposal and other environmental issues when planning production	○ Explain to the pupils that many manufacturing industries use huge quantities of raw materials and resources, *eg electricity, water*, and also produce waste products. Ask the pupils what steps they think could be taken to make manufacturing more environmentally friendly, *eg to reduce waste.*	○ list three ways in which a manufacturer can make its manufacturing more environmentally friendly, *eg reducing waste, reducing materials used, reducing energy used, planning to reuse parts*
○ that users place a different value on hand-made and high-volume products	○ Discuss with the pupils whether they prefer hand-made or high-volume items. Talk about why some people want hand-made products and are willing to pay a premium for them, and how we value these items in different ways, *eg carry out a product analysis of garments or interior furnishings*.	○ describe why people might value hand-made and high-volume products in different ways, *eg one person might think that a hand-made product takes a lot of craft skill, while another might say that it has individual flaws and is never perfect*

■ essential activities ○ optional activities

Points to note

Language for learning when going on a visit

- Ask pupils to make notes during a visit or when listening to a speaker, which they can then use in further activities and in preparation for the DMA. Pupils could discuss the key areas of interest in groups or as a class, talking about appropriate questions to ask. They should be encouraged to use good note-taking strategies, *eg using bullet points, sub-headings, underlining*.

Use of ICT

- Pupils could discuss what it is like for designers to work remotely on a team project connected by ICT. This links to activities/tasks in unit 9C 'Using ICT to link with the world outside school'.

Learning objectives Pupils should learn:	Possible teaching activities	Learning outcomes Pupils:	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 quality assurance systems are used.*		
■ that repetitive quality can be assured with CAM, accurate measuring, inspection and testing, and with the use of templates	■ Discuss with the pupils, or use examples to show, different ways of achieving high quality when manufacturing a product by implementing quality assurance during all the stages of designing and making, *eg accurate measuring, inspection and testing, using templates, using remote control devices such as CAD/CAM equipment*. Explain the difference between 'quality control', where the product is checked at the end of the process, and 'quality assurance', where checking throughout the process ensures quality is achieved at the end. Review with the pupils how these principles can be implemented: – right first time, every time – constantly aiming to improve and innovate products – always looking to exceed user expectations	■ describe what is meant by 'quality assurance' and 'quality control' and give an example of each, *eg visual checking of stitching, using a template or pattern*	
■ how companies are made up of team members with particular roles and responsibilities	■ Discuss with the pupils the different roles required to run a successful business. Ask teams of pupils to talk about the best roles for each team member, *eg project manager, finance manager, personnel manager, production manager, marketing manager,* and what the main tasks for each might be. Ask the pupils to think about each other's skills and abilities, but remind them that the roles need to be flexible because of varying workloads.	■ list the main roles and responsibilities of three different types of managers in a company, and decide which role would suit which team member, according to their skills	**Language for learning in group discussion** • Ask the whole class to discuss the range of managerial roles in a successful business and to develop basic role definitions for each kind of manager. Then, in teams of five, six or seven, the pupils discuss what each manager's tasks might be in their project, and what qualities and skills they might need, *eg a finance manager should be numerate, able to estimate and able to use spreadsheets*. • Ask pupils to write brief notes on which role might suit them and which they would like, and use these to come to a team decision on who should do what. Teamwork like this needs a chair or facilitator, and someone to keep a careful note of decisions.

■ essential activities ○ optional activities

Learning objectives Pupils should learn:	Possible teaching activities	Learning outcomes Pupils:	Points to note
■ about the differences between one-off and high-volume production, and the meaning of continuous and repetitive flow	■ Ask a group of pupils to make a batch of identical, ready-designed products, using different methods, *eg* – *an individual using a template* – *a group working as a production line* – *a group working as a production cell* – *an individual using CAD/CAM* Ask different groups to use different methods and to compare the time taken to make 10 items using each method. The product should include multiple processes, *eg an embroidered logo for a pencil case*. ○ Discuss with the pupils ways of making a product in high volume, or use case studies to talk about how production could be faster, more cost effective and of a higher quality.	■ give one example of how a manufacturer could produce an item more quickly, more cost effectively or of a higher quality	**Use of ICT** • Pupils could use CAD/CAM to design and make an embroidered logo for a product. This links to activities/tasks in unit 8C 'Using ICT to support making'.
○ how user research helps designers to develop products that meet users' needs	○ Discuss with the pupils how to identify the users of a particular product, and how to research what they want, through product research and user research, *eg by finding out what other businesses are producing, comparing existing products, asking potential customers to test products, providing questionnaires for potential users*.	○ carry out simple product research and user research to identify users and what they want, *eg carry out a survey or observation of users*	
○ how production plans can be broken down into simple stages and represented as a flow chart	○ Ask the pupils to describe how a product is made, by breaking the process down into tasks and drawing a simple flow chart.	○ describe how a product is made, breaking the process down into the main stages and representing the information as a simple flow chart	

■ essential activities ○ optional activities

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