edexcel

Teacher's Guide

Manufacturing (Double Award)

ALWAYS LEARNING

PEARSON

Contents

About the new qualification

The new Edexcel GCSE in Manufacturing is similar to our current qualification. There are still three units, with the same titles, but they no longer carry the same weighting. The internally assessed elements of the programme now form 60 per cent of the qualification, *Unit 1: Designing Products for Manufacture* (30 per cent) and *Unit 2: Manufactured Products* (30 per cent). The externally assessed element, *Unit 3: Application of Technology in Engineering and Manufacturing* is now 40 per cent.

Clearer content

Most of the content remains the same for the three units, with the exception of the requirement to 'make a prototype' which is included in Unit 1. The sections on material preparation; tools, equipment and machinery; and processing materials and components in Unit 2 now have a clearly-defined range of requirements.

Controlled assessment

The internally assessed units are now subject to controlled assessment. This control is applied to task setting, task taking and task marking and is explained in more detail in *Controlled assessment* on *page 21* of this document and in the *Controlled assessment* section in the specification.

The control will also apply to the conditions under which students prepare their evidence. There will be a time limit of 23 to 33 hours for each of the two internally assessed units, and evidence must be prepared under informal supervision. This means that teaching and learning activities will need to be completely separate from assessment in order to allow assessment to be completed within the timescale.

Controlled assessment applies to all awarding bodies.

Both internally assessed units will be marked out of a raw score of 50 marks.

Why choose Edexcel?

Edexcel will continue to provide a range of six different End Tests for Unit 3 covering the following sectors.

- Printing and Publishing, Paper and Board
- Food and Drink, Biological and Chemical
- Textiles and Clothing
- Engineering Fabrication
- Electrical and Electronics, Process Control, Computers, Telecommunications
- Mechanical, Automotive.

This allows students' learning and research to be on an area that interests them.

Course planner

The qualification has been designed to be delivered as a two-year course. However, it can be delivered as a one-year programme and, as a vocational course, it is suitable for Year 12 students.

Vocational aspects should be incorporated into the delivery of the course at every opportunity. Visits to local or national manufacturing companies should be considered a priority. The timing of these visits is a crucial aspect of planning. If suitable visits or work experience opportunities are not available or practical, the course team should organise for guest speakers to provide a relevant input. Most local authorities will have a person responsible for supporting work-based learning and work-based contact. The Science, Engineering and Manufacturing Technologies Alliance (SEMTA) and the Engineering Employers Federation can also help to set the GCSE in a vocational context. Centres are encouraged to draw on these organisations for support. Schools may find links with local colleges beneficial, as would any links formed through the Education Business Links Organisations.

Planning your teaching

This is a Double Award GCSE: the recommended weekly time allowed is 20 per cent of the normal timetable, approximately five hours per week over two years.

There is no specific order in which this programme should be delivered but the provision of assessment opportunities will need to be considered when planning a timetable. Units 1 and 2 are assessed under controlled conditions and should be completed within the prescribed timescale of 23 to 33 hours. This equates to between 5 and 6½ weeks based on delivery over two years.

The programme requires blocks of time, particularly when considering the need for industrial visits, and whole morning or afternoon sessions are advisable. This will enable the team to arrange visits, research etc without disrupting the normal timetable.

If your centre is delivering Design and Technology at Key Stage 4, it may be worth considering how aspects of this could support the learning required for GCSE Manufacturing.

Many students will not have studied any aspect of manufacturing before and will need a general introduction to the work of a manufacturer, as well as the tools, equipment and processes they use. For this reason it may be appropriate to begin the programme with workshop activities in order to develop the appropriate skills.

Manufacturing is a complex area and the units within the GCSE have strong links with each other. Unit 1 covers design skills that can be fully exploited only with an understanding of how products are manufactured, which is also a requirement of Unit 2. The application of technology spans both these units and is delivered and assessed in Unit 3. Unit 3 is externally assessed and students should be taught examination techniques to enable them to achieve maximum success.

Students are encouraged to use manufacturers' and sector-specific websites during their study and centres need to consider this requirement when planning access to resources.

Whilst making a range of simple manufactured products, students will have the opportunity

to develop and use the practical skills needed to complete the controlled assessment for Unit 2. They will also learn about various manufacturing materials and how they can be used. You can also introduce other aspects such as reading manufacturing drawings, product specifications and production plans at this point.

When students have developed their making and teamwork skills sufficiently, to be able to work to the highest achievable level of accuracy, they may be introduced to the controlled assessment for Unit 2. It is important that teaching and learning are separate from assessment, and students should have developed and practised all the skills required for the controlled assessment before beginning the work.

After they have completed the controlled assessment, students should have sufficient knowledge to start learning about designing products for manufacturing. It is important that students are taught how to analyse a client brief, the content of a product design specification and how to analyse the advantages and disadvantages of different design solutions. They will also need to be taught how to present their chosen design solutions, including manufactured prototypes, to the client in order to 'sell' their ideas using a range of presentation techniques.

The most effective method for students to learn the content for the assessment of Unit 3 is probably to introduce the technical content during delivery of Units 1 and 2.

Delivery models

The tables below are example delivery models. They are not intended to be prescriptive, but may be a useful start to programme planning.

Model 1

This model would be most suited to centres where the programme is delivered within the centre by an individual teacher.

	Autumn term		Spring term		Summer term
Year 10	Introduction	Teaching and learning Unit 2	Teaching and learning Unit 2	Assessment Unit 2	Introduction to Unit 1
Year 11	Teaching and learning Unit 1		Assessment Unit 1	Teaching, learning and assessment Unit 3	

Model 2

This model would be appropriate where centres are using the facilities of a local college or training provider to deliver the 'making' unit, which may require physical resources not available in house .

	Autumn term		Spring term	Summer term
Year 10	Introduction	Teaching and learning Unit 1		
		Teaching and learning Unit 2		
Year 11	Teaching and learning Unit 1		Assessment Unit 1	Teaching, learning and assessment Unit 3
	Teaching and learning Unit 2		Assessment Unit 2	

Teaching ideas

Unit 1

1: Design briefs and specifications

Learning aim

To interpret the key features of a design brief and produce a design solution that meets the needs of the client.

Learning outcomes

To be able to:

- analyse the design brief to identify the key features of the product
- produce a design specification that identifies product criteria and material constraints
- explain how the product satisfies client needs.

Activities

- Students discuss the key features of a product described in a design brief provided by the teacher.
- Students create a design specification based on their interpretation of the design brief.

Follow up

Hold an open discussion with students about the needs of clients in modern business, exploring the challenges of meeting design briefs which require increasingly technologically advanced techniques and materials.

2: Manufacturing prototypes

Learning aim

To understand the purpose of creating a prototype and identify the lessons learned from production and testing.

Learning outcomes

To be able to:

- select and use materials, parts and components which are appropriate to satisfying a design specification
- plan the construction of a prototype, considering cost, timescale and the tools, equipment and machinery which would be required
- implement the design specifications to create a prototype which exemplifies how the final product will meet client needs
- evaluate the design specification in response to constructive feedback.

Activities

- Teacher-led activity to introduce students to the concept of prototyping, with exemplar prototypes.
- Students to draw up a prototype production plan which considers all factors involved in producing a prototype.
- Students to produce a prototype using materials, parts and components, as specified in their production plan.

- Students to give feedback on each others' prototypes, updating their own design specification in response to feedback.

Follow up

Students could compare their prototypes with the exemplars and discuss the importance to a client of build quality, level of detail and aesthetic qualities of the prototypes.

3: Presentation

Learning aim

To present a design solution effectively, making clients aware of how it satisfies the design brief.

Learning outcomes

To be able to:

- understand the range of presentation techniques available
- select an appropriate presentation technique for their audience
- present their design solution to a client, highlighting the areas where it satisfies the design brief.

Activities

- Teacher-led activity to introduce students to different presentation techniques.
- Students to present their design solution in front of the class or in small groups.
- Students to give feedback on each others' presentations from a client's perspective.

Follow up

Students could adapt their design solution based on client feedback – how would they change their design solution if the client demanded that a different material was used?

Unit 2: Manufactured products

1: Teamwork

Learning aim

To understand team roles and develop an effective team.

Learning outcomes

To be able to:

- state the role/s you would be best suited to in a team
- make informed decisions regarding team composition
- allocate management and manufacturing roles and responsibilities.

Activities

- Discuss management and manufacturing roles and responsibilities, for example managing director, quality manager, safety manager.
- Students complete Belbin's questionnaire on team roles and ascertain their preferred team role (for example shaper, plant, monitor-evaluator, finisher).
- Students justify the roles and responsibilities they would be best suited to based on the outcomes of the questionnaire and the available roles.
- Organise 'best fit' teams.

Follow up

Carry out *Teaching idea 2* (below) and evaluate the performance of the team when undertaking a manufacturing task – is the team composition correct?

2: *Teamwork, production planning, schedule for manufacture*

Learning aim

To understand why forward planning is necessary when producing a quantity of a simple product.

Learning outcomes

To be able to:

- work as a member of a team to produce a quantity of a simple product
- evaluate the production process
- produce a simple schedule for manufacture that takes into account the above evaluation.

Activities

- Explain how one of the products can be made (production plan).
- Teams to produce a quantity of the product (five).
- Students evaluate the production process, concentrating on effective deployment of resources only (people, materials, equipment etc).
- Introduce a schedule for manufacture.
- Students (in teams) produce a simple schedule for manufacture based on findings from the above evaluation.

Follow up

Compare schedules for manufacture from each team – how do they differ, and why?

Examples of possible products: a hardback book cover, a small vacuum formed object, a healthy biscuit, a draw string bag.

3: *Quality control techniques*

Learning aim

To understand and apply some quality control techniques.

Learning outcomes

To be able to:

- state some of the techniques manufacturers use to ensure that products are of the required standard
- observe quality control techniques in action
- apply the observed techniques to the products to be manufactured as part of the GCSE in Manufacturing.

Activities

- Organise a visit to a local manufacturer. Ask for the visit to focus on quality control techniques (inspect, test, compare, check etc.) and indicators.
- Students observe the techniques in action, using a mind map or spider diagram (who, what, where, how, why, when) to reflect on them.

- Students feed back observations/reflections to the rest of the group.
- Students apply the techniques (as appropriate) to the production of the simple product.

Follow up

Introduce the concept of critical control points – does this have an impact on the schedule for manufacture?

Unit 3: Application of Technology in Engineering and Manufacturing

1: Global environment

Learning aims

To learn about the impact on the global environment of waste disposal and landfill. To learn about the increasing pressure on governments and industry to place recycling on the environmental agenda. (These learning aims can be/are also linked to work on materials.)

Learning outcomes

To be able to identify:

- the parts in a given product
- the material used in the parts of a given product
- how an identified material can be disposed of
- how an identified part can be recycled.

Unit coverage

Impact on the global environment and sustainability.

Materials required

A manufactured product with a good range of parts and materials that are suitable for recycling. Product should be similar to previously chosen pre-release products such as:

- wire bound calendar
- food packaging
- fabric laptop case.

Students should have access to sample materials, textbooks, the internet, etc.

Starting points

You can use this activity to introduce students to the increased concerns about waste disposal and landfill. Discussions can focus on:

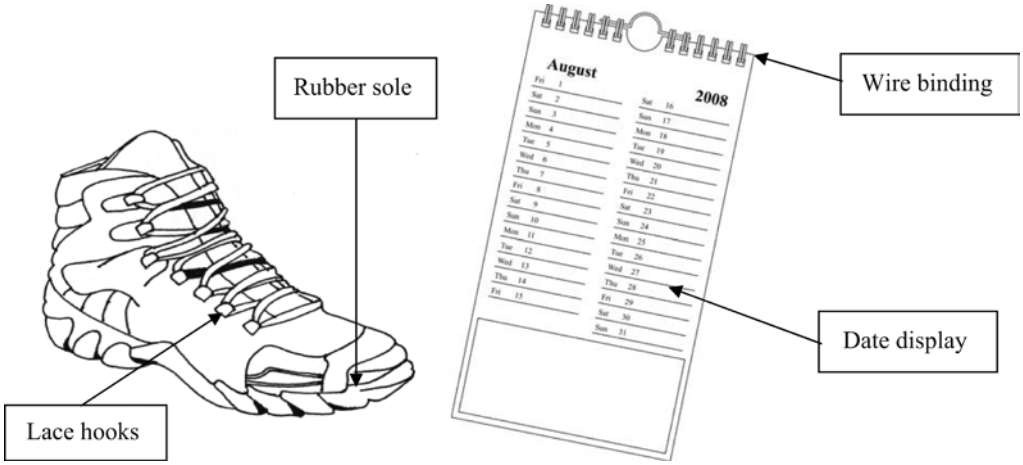
- reasons for recycling
- converting waste into new products
- conserving world resources
- pollution concerns
- energy saving.

Suggested approach

Plan how to group your students. It may be helpful, for example, to group more-experienced students with less-experienced students. Groups of three work best.

Give each group a manufactured product and a scenario which could be a manufacturing company wishing to save costs and materials by making its products recyclable.

Each group will investigate the product, disassembling if necessary, and complete a table listing the parts and material used and how that material can be disposed of or recycled.



Part/component	Material	Method of disposal/recycling
Date display	Card	Suitable for making new paper products such as newsprint, cardboard, packaging, tissue and office items.
Wire binding	Mild steel	Melted using an electric arc furnace and used for new light gauge products such as cans and appliances.
Lace hooks	Plastic	Shredded, washed, melted and moulded into new products such as new bottles, garden furniture or fleece jackets.
Rubber sole	Synthetic rubber	Can be ground up and used to produce playing surfaces for synthetic sports fields.

Consolidation/checking learning

Students should discuss and reflect on their findings.

- Talk to students about their findings/conclusions.
- Group discussion when important issues arise.
- Encourage students to think about lots of alternatives.
- Argue with them/can you change their mind/play devil's advocate.
- Encourage other points of view.

Encourage students to complete the table so they have a written record and checklist for future work.

Follow up

Develop and expand on recycling to include:

- designing products for easy recycling
- use of recycled products
- pollution issues in manufacturing
- efficient recovery technologies
- waste management in manufacturing.

Student guide

Is this the right subject for me?

GCSE Manufacturing is the subject for you if you want to:

- learn in both classroom and practical environments
- learn in a realistic way and apply your skills in work-related situations
- develop skills that are highly valued by employers and higher education
- carry out a range of activities – including investigations into different aspects of manufacturing industries
- gain a good understanding of the main principles of manufacturing and an insight into how companies operate
- cover a range of manufacturing, which could include printing, food, textiles and engineering plus many others
- learn about manufacturing practices and processes.

What will I learn?

There are three units which make up the GCSE in Manufacturing Double Award (equal to two GCSEs).

Unit 1: Designing Products for Manufacture

You will develop a design specification and design and manufacturing proposals for a product, produce a prototype and draw up a final design and manufacturing solution. You will present your design solution and make modifications based on feedback received.

Unit 2: Manufactured Products

You will work as part of a team to manufacture a quantity of products. You will use a production plan, develop a schedule for manufacture, select and use suitable materials, tools, components and equipment and machinery, and apply a range of quality control techniques.

Unit 3: Application of Technology in Engineering and Manufacturing

You will learn about the stages involved in manufacturing a product and the advantages and disadvantages of using modern technology in manufacturing. You will investigate the use of ICT, modern and smart materials and control technology in manufacturing, and the impact of modern technology on the design and manufacture of a product in a particular manufacturing or engineering sector. You will also learn about how new technologies can be used to benefit the workforce, the wider community and the global environment.

How will I be assessed?

During the course you will carry out a number of assignments and activities based on Units 1 and 2. After completing your assignments and activities, your teacher will mark your work. During your course you will build up two separate folders containing your work for Units 1 and 2. These folders will count towards your final grade. Unit 1 is worth 30% of the total marks and Unit 2 is worth another 30% of the total marks. You will take a written exam paper based on Unit 3, set and marked by Edexcel. The mark for your written exam will also count towards your final grade and is worth 40% of the total marks. The exam is taken at the end of Year 11. Questions are written for students with differing levels of ability to help you cope.

What do I need to know, or be able to do, before taking this course?

You will have developed some related knowledge, skills and understanding, during your Design and Technology lessons at Key Stage 3. These will be very useful during this course, but you do not need to have studied manufacturing before starting the GCSE. Manufacturing is about designing processes to produce products on a large scale to a required standard, so it is more important that you have a lively and enquiring mind, an interest in manufacturing, a willingness to explore new ideas and an ability to communicate your ideas effectively.

What can I do after I've completed the course?

Students gaining a Double Award GCSE in Manufacturing will have access to a range of career and further education opportunities. You learn and use a variety of skills – that are in great demand – throughout the course. These skills are recognised and highly valued by employers. If you wish to continue studying, you could move on to, for example:

- a Diploma in Manufacturing and Product Design or Engineering at either Level 2 or Level 3
- a BTEC First or National course, such as Manufacturing Engineering, Art and Design or Hospitality and Catering
- an A Level or AS in Design and Technology or Engineering.

You could then continue your studies in higher education, on a BTEC Higher National or on a degree course, either full time or part time whilst working. You could begin your working career in a range of manufacturing contexts. The Apprenticeship scheme will allow you to continue training towards higher-level qualifications during the first years of your career. Your employment opportunities aren't limited to manufacturing. The skills you develop will be valuable in architecture, business management, design, construction, engineering, hospitality, ICT, marketing, project management and teaching.

Next steps!

If you are interested in studying GCSE Manufacturing you should start to find out more about the subject. Try the following.

- Talk to the manufacturing teacher or anyone in the Design and Technology/ Manufacturing Department at your centre to find out what they are planning for you.

- Ask Year 10 and 11 students about their experiences in manufacturing and if they enjoy their lessons.
- Go on the internet and look at employment websites such as www.fish4.co.uk/iad/jobs. This will give you an idea of the vast range of employment opportunities available in manufacturing.
- Look on the Edexcel website and follow the links to the new GCSE starting in 2012. There is a lot of useful information there about what you will be studying and how you will be assessed.

The difference between engineering and manufacturing

In order to decide which course is best for you, you need to know what these courses offer, and how they are different.

Engineering is 'the application of ingenuity, scientific knowledge, natural laws and physical resources, to overcome problems'. Engineers are concerned with developing economical and safe solutions to practical problems, by applying mathematics and scientific knowledge while considering technical constraints. This is likely to include design and use of materials, structures, machines, devices, systems and processes in order to achieve the desired objectives.

The broad discipline of engineering includes a range of more specialised sub-disciplines such as electrical, electronic, maintenance and control engineering. Each of these sub-divisions has a specific emphasis on certain fields of application and particular areas of technology.

The GCSE Engineering course is designed to introduce you to some of the varied skills and activities common to engineering. This course will be suitable for you if you feel confident in applying knowledge and scientific principles to solve problems.

Manufacturing, on the other hand, is 'the use of tools and labour to make things for use or sale'. Manufacturing covers a wide range of operations from the 'one-off' craftsperson to large-scale production. The GCSE Manufacturing mainly covers industrial production, in which raw materials are transformed into finished goods on various scales of production. At the same time, goods need to meet customer requirements for quality, quantity and availability.

Manufacturing includes a very broad range of activities covering everything from purchasing to quality control. It also includes an understanding of the manufacturing processes used to convert materials into products.

The GCSE Manufacturing course is designed to introduce you to some of the varied activities involved in a typical manufacturing industry. The GCSE Manufacturing course is most suited to students who want to work in the manufacturing industry, performing one or more of the many activities involved in making products.

Both courses involve an understanding of mathematics, science and technology – they are much more than courses where you just use your hands.

Assessment overview

The grid gives you an overview of the assessment for this course.

We recommend that you make this information available to students to help ensure they are fully prepared and know exactly what to expect in each assessment.

Unit 1*	Percentage	Marks	Time/pre-release	Availability
Designing Products for Manufacture	30	50	Internally assessed. 23-33 hours. No pre-release material. Centres can contextualise task to suit local needs.	June.
Unit 2	**Percentage**	**Marks**	**Time/pre-release**	**Availability**
Manufactured Products	30	50	Internally assessed. 23-33 hours. No pre-release material. Centres can contextualise task to suit local needs.	June
Unit 3	**Percentage**	**Marks**	**Time/pre-release**	**Availability**
Application of Technology in Engineering and Manufacturing	40	110	Externally assessed. 90 minutes. Pre-release material available September.	June

Unit 1 Description	Knowledge and skills
Students produce a design solution for a manufactured product under controlled conditions. **See controlled assessment on page 21 for more information.**	The Assessment Objectives covered in this assessment are: AO1: 6% AO2: 20% AO3: 4% Students will carry out a series of activities including the following: • Analysing the design brief • Producing a design specification • Producing, selecting and testing design solutions • Producing a prototype of the product • Presenting their design solution and modifying it based on client feedback.
Unit 2 Description	**Knowledge and skills**
Students to produce a quantity of a manufactured product that meets design requirements. **See controlled assessment on page 21 for more information.**	The Assessment Objectives covered in this assessment are: AO1: 3% AO2: 24% AO3: 3% Students will carry out a series of activities including the following: • Working as part of a production team • Interpreting product specifications • Producing and modifying a schedule for manufacture and modifying production plans • Selecting and using suitable tools, components and processes to manufacture a quantity of a product • Using quality control techniques.
Unit 3 Description	**Knowledge and skills**
The examination paper will consist of a mixture of short- and long-answer questions. As this unit is shared with the GCSE in Engineering (Double Award), centres can also choose to take the paper that focuses on one of the three sectors within that qualification. The paper focuses on one of four chosen manufacturing sectors: • printing and publishing, paper and board • food and drink, biological and chemical • textiles and clothing • engineering fabrication. The paper consists of two sections Section A is made up of general questions about the chosen sector. Section B focuses on a specific product identified in pre-release material.	The Assessment Objectives covered in this assessment are: AO1: 21% AO2: 9% AO3: 10% Students will investigate the impact of the following: • Information and communications technology • New components and a range of modern materials, including smart materials • Control technology.

Examination questions

This guide provides a bank of exam questions, with student answers and examiner comments, that you can use with your students to show them what they will need to do in the exam. The questions have been chosen to reflect the different question types that are asked and to help highlight common student misconceptions.

Section A: scenario questions (AO1, AO2 and AO3)

Communications technology is now widely used by manufacturers.

(a) Name two examples of communications technology.

(b) State the traditional communications method it has replaced.

(c) Explain one benefit to the manufacturer of using this replacement technology.

(8 marks)

Student answer 1

a) email

Mobile Phone

b) Sending letters

Pager

c) email is received quicker than a letter and still gives a hard copy.

You can walk around and talk to someone with a mobile, but a pager just lets you know you have a call.

Examiner commentary

a) The student's reference to 'email' and 'mobile phone' would have earned the two marks.

b) The student's reference to a 'letter' and 'pager' would have earned the two marks.

c) The first part where the student acknowledges that receiving an email is quicker than receiving a letter would have earned them one mark. Explaining that this leaves a manufacturer with a hard copy earns a further mark. Where the student states a mobile phone allows you to walk around whilst talking would have earned a mark, and stating that a pager only alerts you of a call would also have earned a mark. Giving part C a total of four marks.

The student received full marks for this question. 8/8

Student answer 2

a) email

Database

b) Post

Spreadsheets

c) Faster to receive

All the information needed can be found and stored in one place. It also makes it more secure.

Examiner commentary

a) The student's reference to 'email' would have earned one mark. Spreadsheet is incorrect, as it is not a communications technology.

b) The student refers to 'post'. One mark can be awarded as the student can be given the 'benefit of the doubt' against a correct answer of 'letters' or 'mail'. Spreadsheets may sometimes be a substitute for a database, but this is not communications technology and therefore no marks awarded. Benefit of replacement within second response, ie spreadsheet/database, is incorrect for the question being asked, no marks awarded.

c) A benefit of email is speed to the manufacturer; therefore one mark can be awarded for 'faster'. As there is no explanation as to 'how' it is a benefit, no further marks can be awarded. 3/8

Section B: scenario exam questions (AO1, AO2 and AO3)

The utilisation of modern technology in the manufacture of a product has brought changes. Explain these changes in:

a) i) the type and size of the workforce
ii) the working environment
iii) the global environment.

b) Describe one disadvantage that modern technology has had on the workforce.

c) Describe one advantage that modern technology has had on the global environment.

(10 marks)

Student answer 1

a)

i) With the introduction of machines workforces have had to diversify to enable themselves to keep a job, those who don't lose out on jobs to robots. Therefore workforces get smaller but more machines replace the humans.

ii) New safety procedures are introduced to make sure the robots environment is safe for them to carry out their work. More noise is created for the robots. Usually managers base the working environment around the robots.

iii) Lots of pollution is created and lots of energy wasted. Heat is created. A lot of robots are un-efficient.

b) Less people have jobs due to machinery taking their place. More natural resources used.

c) It has made sure that materials they are using are of good quality are as environmentally friendly as possible. They use recycled products. Modern technology has also allowed packaging etc to be recycled through them making them into new products/packaging.

Examiner commentary

a)

i) The student refers to the workforce getting smaller in size, earning one mark. The reference to workers having to become diverse in their role in order to keep their job meets the criteria of '*higher level of development skills required*' from the mark scheme, enabling them to gain one more mark.

ii) Reference to safety within the working environment gains one mark.

iii) The student's response regarding pollution being created gains one mark, as it refers to carbon emissions.

b) By linking two points, this student is awarded two marks.

c) The student gives three examples; they all state the same response. Only one mark can be awarded. 7/10

Student answer 2

a)

i) There is not many people on workforce, all done by machines and computers

ii) There is not a working environment with people in it. It's all computers and robots because it is a health and safety risk and cost money to train.

iii) Because CAD and CAM use a large amount of electricity, power plant's having to increase their power output causing more pollution.

b) There are more machines so less people have jobs.

c) Less pollution and less green house gases

Examiner commentary

a)

i) Smaller workforce gains one mark.

ii) The student misinterprets the configuration of the question. No marks awarded.

iii) Increase in electricity and causing pollution can be 'best fit' into carbon emissions, gaining the student one mark.

b) Basic statement gains one mark.

c) The two statements encompass the same response, gaining the student a 'best fit' of one mark. 4/10

Controlled assessment

Controlled assessment involves students undertaking assignments and is similar to coursework except that controls have been added to ensure the work is all the student's own.

There are three aspects to the controlled assessment: task setting, task taking and task marking. The level of control for each activity in each subject is specified by Ofqual. Ofqual also stipulate whether and how often the task must change.

This section explains the level of control required for each activity, what it means for you and your students, and the frequency of change.

Task setting

This is very similar to the current arrangements, so it will be familiar.

What is the level of control?

High.

What does this mean?

The tasks are set by Edexcel and will be made available in September.

How often will the task change?

We will look at the task in the light of student performance and make any amendments necessary to make the task clearer.

We will review the task every two years.

Any students wanting to retake the assessment will need to use tasks available for the session in which they are retaking, regardless of the task they did originally. Students must choose an alternative task.

Task taking

The controls for taking the task have been designed to ensure that the task is carried out by the student and is all their own work. This means that students cannot produce work at home and bring it to the classroom. Students may produce work for assessment at recognised centres, such as training centres, as long as this work is supervised.

What is the level of control?

Medium.

What does this mean?

All work, with the exception of research and preparation, must be carried out under informal supervision. Research and preparation may be completed under limited supervision.

Each of the controlled assessments should be completed in 23–33 hours. Time for teaching and learning is not allowed for during the assessment tasks. It is important that teaching and learning is separated from assessment.

Task marking

This is similar to the current arrangements, and so will be familiar.

What is the level of control?

Medium.

What does this mean?

You will mark all the tasks. You then fill in a form to show all the marks achieved. Edexcel will ask for a sample of the work to moderate – including student work with high and low scores. Edexcel will moderate the work and you will receive a summary of the findings on results day.

Training from Edexcel courses on marking tasks may be available to help you mark the work effectively. Our specification experts can also provide support, just email Ask the Expert vocgcsemanufacturing@edxcelexperts.com

The GCSE Code of Practice requires that assessors record full details of the nature of any assistance given to individual students. The level of assistance and guidance given to each individual student should be taken into account when assessing their work. The specification gives further details about what is meant by the different levels of support and guidance.

Controlled assessment exemplars

The student must receive a written design brief from a client. The client may be 'real' or you can play the role of the client.

The design activity must be based on a manufacturing solution. The activity differs from 'general product design' in that it should be based on a manufacturing problem. Design options should include various manufacturing methods and should consider the most appropriate solution to the client's problem.

Analysis

Students will need to analyse the client brief in order to determine and understand the client's needs. The client's needs include: cost, quantity required, intended market, timescales and function. In order to meet these needs, the product must display particular features including: styling, aesthetics, size, quality standards and performance. In order to achieve the higher marks for this activity, students need to explain in detail the client's needs and the features of the product. The student is not expected to recall all this information. They will need to undertake research in order to fully understand the relevance of these features.

Student response 1

My client requires a bike light which will be used on the bike, by teenagers. It must allow the bike to be seen by oncoming traffic, pedestrians and other cyclists and have a flashing setting.

Moderator comment

This statement is a description of the product's function. However, it would not meet the highest level of achievement. In order to improve the level, the student would need to clarify what is meant by 'seen by ...' This could include a statement, or a justification, of the distance involved.

Student response 2

My client will require it to be up to British standards and be able to withstand regular use, and also be shock proof as well as rust proof. It should also comply to the British Standard BS6102 which it should always have at least one LED on at any time and also have nothing blocking the light.

Moderator comment

The statements relating to 'regular use', 'shockproof' and 'rust proof' are descriptions which could be explained in more detail. However, the reference to BS6102 describes the standard, by naming it, and also explains the relevance of this standard, and how it might affect some aspect of the design activity. This statement would meet the highest level of achievement.

Product design specification

Students will then need to formalise this information in a product design specification which records details about: product design, materials and material constraints, production requirements and quality standards. In its simplest form this would consist of a series of design criteria. However, in order to meet the highest level of achievement students would need to demonstrate their understanding by explaining these criteria.

An example of this type of evidence is as follows.

Regulations – The product should conform to the following requirements:

At night, the headlight must emit a white light visible from a distance of at least 500 feet.

If capable of emitting a steady light it must be marked as conforming to BS6102/3 or an equivalent EC standard. If capable of emitting only a flashing light, it must emit at least 4 candela.

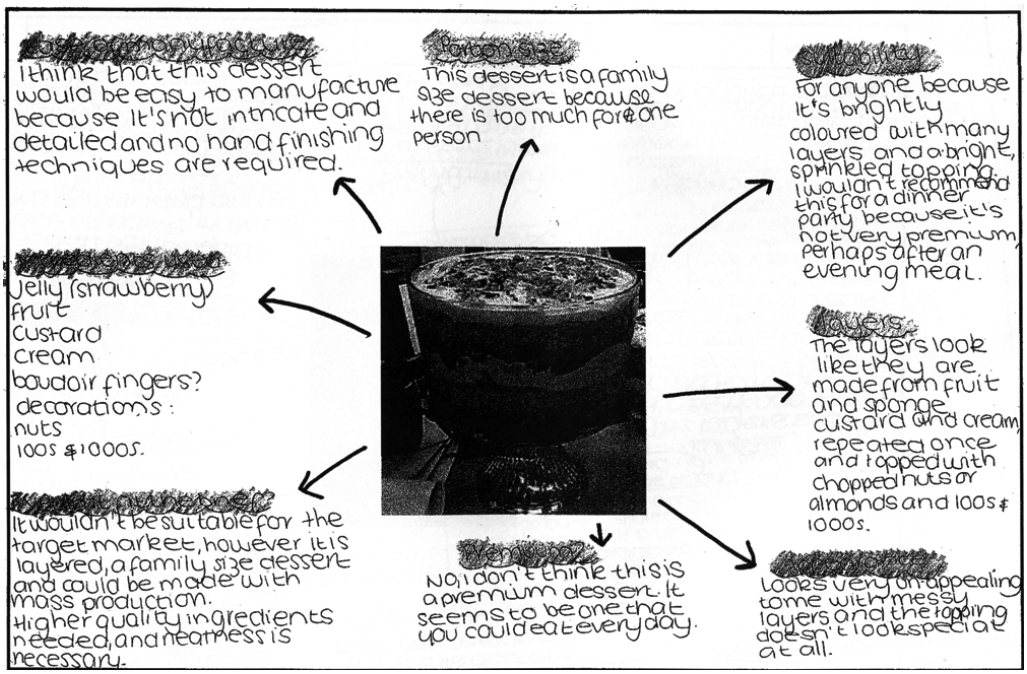
Moderator comment

Both of these statements are clear criteria which are measurable and inform the design activity.

Design solutions

Students will need to produce a minimum of two different design solutions which consider how the product could be made to meet the client's manufacturing needs. These design solutions may be in the form of annotated sketches and should contain sufficient detail to fully explain the product design features and the appropriate manufacturing processes.

An example of the presentation of part of a solution is as follows.



Moderator comment

The student should set out to fully explain both the product design and how the product could be made to meet the client's needs. This explanation should include manufacturing details such as appropriate processes and batch sizes.

Students must be able to show that they can select the most appropriate design solution from a range of initial design ideas. They need to evaluate their different design solutions in order to identify how each one meets various aspects of the client's needs. To do this, they need to devise and apply tests against the design criteria at critical points in the development. The final design and manufacturing solution must include:

- justification of the final choice that refers to the key features in the client design brief and design specification
- details of the final design idea.

Students will then make a prototype of their final design solution. This prototype should be designed to demonstrate how some of the design criteria have been met. In a food context, for example, a student might make one of a batch of desserts in order to demonstrate that the idea is feasible, the ingredients are compatible, the taste is as required and the texture and colour are achievable. The level of marks awarded depends on the level of skill used and the accuracy achieved. In each case, the marks awarded would also depend on the level of guidance and support required by the student.

Students will need to fully explain their chosen final design solution using notes and appropriate annotated graphical communication. This explanation should form part of the work submitted for assessment. The students will 'sell' their final design solution to the client in a formal presentation. In the presentation students should explain why they chose the particular solution and why it was considered to be better than other possible solutions. In order to make the presentation, students will need to select and use an appropriate range of presentation techniques.

Students must be given detailed and relevant feedback so they can formulate any possible modifications to their final design solution.

This is mainly an individual activity and, although some group work is acceptable, the work submitted for assessment must show what the individual student has done. You should be aware that group work may restrict student performance if supporting evidence is not provided in support of individual students' efforts.

2243ma240512S:\LT\PD\GCSE 2012\TSMs\Edexcel GCSE 2012 Manufacturing TSM Issue 2.INDD.1–28/1

For further copies of this publication, please send an email to the following addresses:

UK customers: publication.orders@edexcel.com
International customers: intpublication.orders@edexcel.com

Also, you can download copies at: www.edexcel.com

For more information on Edexcel and BTEC qualifications please visit our website: www.edexcel.com

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: Edinburgh Gate, Harlow, Essex CM20 2JE
VAT Reg No GB 278 537121

Publication code UG033255