

Moderators' Report/
Principal Moderator Feedback

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Pearson Edexcel GCSE in Manufacturing

5MN01 Paper 01

Designing Products for Manufacture

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Unit 5MN01_01

Designing Products for Manufacture

General Comment

This was the fourth year of assessment for the specification. Centres submitted evidence from a range of different manufacturing sectors.

The starting point for this unit is the design brief provided to students. Careful consideration must be given by centres to formulating the brief. This year it was observed that the number of products required by the design brief in some instances added an unnecessary level of complication to the task. For example, the complexity of designing for manufacture an artefact with a production run of 10,000 is potentially significantly more complex than that associated with a batch of 100. Centres should consider the implications of a brief linked to production numbers beyond those that can reasonably be appreciated by GCSE level students.

Design briefs should be structured as such that students operating at the lower performance levels are guided towards producing appropriate evidence while those operating at the higher levels have sufficient opportunity to demonstrate independence.

Quality of Written Communications (QWC) is assessed in 6 out of the 8 criteria but was rarely referred to specifically by centre assessors. Assessment of QWC considers students' abilities to:

1. Write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear.
2. Select and use a form and style of writing appropriate to purpose and complex subject matter.
3. Organise relevant information clearly and coherently, using specialist vocabulary when appropriate.

While students performing at the higher levels typically provided evidence that met the demands of sections 1 and 2, section 3 was sometimes more problematic. Where students submit portfolios that lack organisation, or specialist vocabulary, there is an increased risk of the moderator being unable to agree the centre mark awarded. The use of specialist vocabulary should reflect the demands of the specification. For example a student that has studied a manufacturing GCSE, with a print and publishing focus, could reasonably be expected to be familiar with commercial printing technologies such as lithography.

Most centres provided clear photographic evidence to support the award of marks. Photographic evidence is particularly useful for the following assessment criteria:

- e) Testing and selecting the final solution
- f) Prototype
- g) Presentation techniques

The quality of witness statements was variable. When high quality witness statements accompany students' work, marks from the higher ranges were regularly accessed. Where witness statements are generic, lack detail or are simply not provided it is unlikely that the more ephemeral skills such as independence, will be sufficiently evidenced for the high marks to be justified.

The witness statement is to support marks awarded for criterion f) - Prototype.

Where the same witness statement is repeated for all students, with only the name changed, there is an increased potential for moderators not to agree centre awarded marks.

Some centres provided students with prepared templates into which the student entered their evidence. While this may be a useful support tool for some students, it can be problematic. In some cases it appeared that students were prevented from including more text, or images, because they had used all the space available on the template. Where centres do provide a structure for students to enter their evidence into they should ensure that the format does not restrict students ability to perform to their full potential.

The maximum score for unit 5MN01 is 50, and this unit carries 30% of the overall assessment weighting for the double award GCSE Manufacturing.

Administration

Most centres addressed all aspects of administration thoroughly.

The great majority of centres sent the required samples for moderation in accordance with the agreed submission date, allowing moderation to be completed in a timely fashion.

A variety of A4 and A3 sheets of paper and card were submitted with many different types of binder being used. Centres should encourage students to use A4 sheets, preferably in portrait mode, with each portfolio fastened together using a single treasury tag through the top left hand corner.

In most cases samples were well organised and a Controlled Assessment Record Sheet had been completed for each student, giving a list of marks.

Centre Assessment

Many centres made good use of the expected evidence detailed in the teacher support book. Where there was a clear link between expected evidence, student work and teacher assessment, students were able to access the full range of marks available. Where the expected evidence is absent from students work it is unlikely they will achieve marks from the higher ranges.

Witness statements were used effectively by some centres, but others made ineffective use of them, if at all. Assessment grids contain 'with limited guidance', 'with guidance', or 'worked independently', etc. and require a teacher witness statement and/or comments to help a remote moderator

agree the score awarded. Depending on what is being assessed, it is important that witness statements or observation reports are completed by teachers to authenticate students' work and provide evidence that students have achieved the level of performance required by the assessment grid.

In many cases good use was made of pictures and photographs. This and other similar types of media are to be encouraged together with the use of ICT. Word processing of portfolios, with import of images, is to be encouraged – preferably with the page orientation set to portrait mode, as is normal for written work. In a number of cases the students may benefit from being shown how to interpret the evidence requirements more carefully for each mark band, and at times it was difficult to find a real progression of the 'design for manufacture' processes across the mark ranges.

Criterion a) – Analysing the brief

Most centres included a copy of the design brief given to students with the moderation samples. The majority of these had been used in previous examination series and provided students with tasks of an appropriate level.

Typically those students that scored the higher marks presented their evidence split into two sections; client needs and key features of the product. These were then broken down into the following sections.

Client needs:

- cost
- quantity required
- intended market
- timescales
- product function

Key features of the product

- Styling
- Aesthetics
- size (with tolerances)
- quality standards
- performance

As commented on in the previous section there were some instances where the design brief did not make it explicit to students if they were to consider designing for a prototype, or a mass produced product. This tended to result in students attempting to produce evidence beyond their expected capacity. For example while it may be reasonable to suggest that a client would want 10,000 artefacts to be produced, it would be unreasonable to expect key stage four students to be able to analyse how long each stage of the commercial production process would take.

Centres might consider focusing different elements of their design brief towards different scales of production. For example students could be asked to consider manufacturing processes for both their own prototypes (as they will produce for criterion f) and the client's final commercial product.

Criteria b) and c)

Most centres separated 'design specifications' from 'manufacturing specifications'. The details given in the client brief are key to students' performance. Where the brief lacks detail it will be difficult for students to access the higher marks available.

Criterion (b) - product criteria and material constraints

For the product criteria students need to consider:

- Product performance
- Intended markets
- Maintenance
- Size (with tolerances)

For the material constraints students need to consider:

- Materials and their availability
- Material properties, characteristics and performance
- Material cost
- Regulations
- Handling and storage
- Health, safety and hygiene
- Scales of production
- Quality standards
- Limitations of available tools or equipment.

The level of detail students provide in this criteria will have a direct link to subsequent criterion d), e) and h). During the moderation process the following observations were made about the above factors;

- Size (with tolerances)

Tolerances should be appropriate to the manufacturing methods being considered. Where CNC equipment, such as laser cutters, are being considered, tolerances of fractions of a mm would be more appropriate than several mm.

- Regulations

This is another area where the level of detail in the client brief, and the nature of the product being considered, to a large extent control the students ability to offer relevant information for this topic. Where students were observed to be successful the associated client brief tended to give specific areas for them to research. For example a client brief that suggests regulations required by the Food Standards Agency must be followed, might guide students to research The Food Standards Act 1999.

Criterion c) - production requirements and quality standards

For the production requirements students need to consider:

- Quantity being made
- Size
- Weight
- Cost
- Time to manufacture

For the quality standards students need to consider:

- tolerances (which relate specifically to those in the preceding criterion b)
- material specifications
- finish
- performance and requirements – with reference to the client's needs.

Access to the higher mark ranges depends on the student's ability to demonstrate a more in-depth understanding of the factors being considered, not simply the amount of evidence presented.

A student that produces a list, for example, of 20 factors related to the cost of the product is not demonstrating the ability to describe, or explain, as required to access the higher mark ranges.

The example below is intended to illustrate the type of progression expected.

- For a list

'The calendar should sell for £1:50.'

- For describe

'The calendar should sell for £1:50. From my research I have found that this is the typical cost of similar products on the market.'

- For explain

'The calendar should sell for £1:50. From my research I have found that this is the typical cost of similar products on the market. This price is also reasonable because it would allow for a 25% profit based on the expected costs of the materials.'

Centres might consider if the resources published by the British Standards Institute would help their students produce valid evidence for quality standards.

Criterion d) – ideas and design solutions

During the moderation process it was evident that some centres had failed to expect their students to address both parts of the assessment requirements for this criterion. While all students provided evidence of the

generation of design ideas, a number did not address the need to show explicit consideration of how the product would be manufactured. The information provided in the publication Manufacturing Controlled Assessment Teacher Support Book clearly states "this is 'Design for Manufacture' both elements must be evidenced – design ideas and the manufacturing of these ideas. If only design ideas are produced, the maximum mark for this criterion is 3"

While students are developing their design ideas they should consider, and make comments about, how their proposals achieve the client's requirements and the specification points from criteria b) and c).

Typically where students only accessed the lower mark ranges this was due to the combination of a lack of detail in their ideas and a lack of information about how the design would be manufactured. Centres should be aware that while carefully produced, high quality rendered drawings that show the appearance of the design proposal are commended, they may not fully address the requirements of the assessment criteria. Marks are allocated based on the student's ability to demonstrate their knowledge of design for manufacturing, not their ability to draw.

Students should be made aware that repeating the same comments about manufacturing for each of the different proposals is unlikely to gain them more marks.

Criterion e) - Testing and selecting the final solution

In order to access the marks available from the higher ranges students need to provide evidence of;

- Objective testing against the design criteria which gives rise to measurable results
- Selecting a final design and justifying this choice with reference to design criteria, client needs and specification.

Students should provide evidence to support the results of their tests.

Criterion (f) – Prototype

This criterion requires students to provide evidence that they have:

- Selected appropriate processes, tools and equipment.
- Used these with skill and accuracy
- Used these in a safe and independent manner.

As much of this type of evidence is ephemeral centres need to consider how they will evidence the marks they award. Where centres provide no explicit evidence to show why the marks were awarded there is a higher potential for the moderator not to agree the assessors marks.

Typical evidence that was provided by centres, whose students accessed the higher mark ranges, included;

- Manufacturing plans
- Annotated photographs of the student using tools, processes and equipment.
- Annotated photographs showing key features of the prototype that could only have been achieved through the application of skill and accuracy.
- Witness statements, or observation records, that make specific reference to how the student demonstrated independence and safety.

Successful manufacturing plans included details of the following;

- materials, parts and components to be used
- processes to be used
- tools, equipment and machinery to be used
- timescales
- health, safety and hygiene factors.

The teacher's guide contains the following comments about witness statements "Note: avoid 'judgemental or evaluative statements'. For students, and witness statements, it is essential to include real details; saying 'appropriate tools', etc, or 'worked skilfully and safely', is not reporting or stating what was witnessed".

Centres are reminded that where appropriate, witness statements must provide sufficient detail to justify the marks awarded.

Criterion g) – Presentation techniques

In order to access the marks available from the higher ranges students need to provide evidence of;

- justifying how and why the range of presentation/communication techniques were selected.
- evidence that the presentation was carried out effectively and in detail.

A range of approaches were used by centres to evidence student achievement in this criterion. In order to achieve the first requirement a common approach that was successful involved students producing a table that considered the merits of a range of presentation techniques.

The teacher support booklet provides more detail about the expected range of evidence for this criterion which centres should make sure they are familiar with.

The second element of the criterion requires a presentation to be delivered, either to a group, or an individual, such as the teacher. Where centres provided observers with a template to record their assessment of the

presentation clear evidence was often generated to support the award of high marks.

Criterion h) – Final review

In order to access the higher mark ranges students need to seek feedback regarding their design proposals from a client. The evidence required, again as described in the teacher guide, consists of two parts.

- A separate description or detailed explanation of how the final solution meets the brief and specification, including details of any earlier modifications.
- Identification and description/explanation of further modifications which would be made following the client's feedback.

While most students provided appropriate evidence for the first requirement of the criterion the second was less well addressed. The focus should be "further" modifications, not a record of modifications already incorporated in the design proposal.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>

