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Moderators' Report/ Principal Moderator Feedback

Summer 2013

GCSE Manufacturing

5MN01 Paper 01

Designing Products for Manufacture

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Unit 5MN01_01
Designing Products for Manufacture

General Comment

This was the third year of assessment for the specification. Centres submitted student work in a wide range of styles with the focus on 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. The brief should result in students being involved in activities of an appropriate level of demand. Where the design brief is vague students operating in the lower mark ranges were observed to produce evidence that did not always meet the demands of the assessment criteria. Where the design brief was too prescriptive students operating at the higher mark ranges were sometimes prevented from exploring a full range of potential solutions. For example, a design brief that states the product will be made from mild steel eliminates students considering alternative materials. This would impact on criterion (b), specification product criteria and material constraints, as well as others.

Quality of Written Communication (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 mark levels typically provided evidence that met the demands of sections 1 and 2, section 3 was sometimes more problematic. The use of specialist vocabulary should reflect the demands of the specification. For example a student that has studied a manufacturing GCSE, with an engineering fabrication focus, could reasonably be expected to be familiar with more specific material names than wood, metal or plastic.

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.

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. A Controlled Assessment Tracking Sheet had been completed, providing the page number and annotation which proved helpful to a moderator. The most difficult portfolios to work with are those that included no contents list, no page numbers, and/or no assessor comments. Where there is no indication of how, and where assessors have awarded marks there is an increased possibility of centre awarded marks not being agreed.

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 student 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 an essential 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

Centres are encouraged to include a copy of the design brief given to students with the moderation samples. This would allow moderators to provide feedback about how fit for purpose they are – ensuring that they will not be too brief nor too complicated for the GCSE requirements.
Many centres are encouraging a 'design & make' or 'product design' solution and not a 'Design for Manufacturing' solution. Students must consider the manufacturing options and details for their design solutions if they are to access the high mark ranges.

Typically the 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

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.
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 clients final commercial product.

Criteria (b) and (c)
Most centres separated 'design specifications' from 'manufacturing specifications'.
The detail of the given client brief is 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 criteria (d), (e) and (h). During the moderation process the following observations were made about some of 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 COSHH must be followed, might guide students to research regulations relevant to any adhesives for the materials being considered.

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

During the moderation process a wide range of student performance was observed with the evidence submitted for this criterion. Typically where students were provided with a detailed client brief they were more likely to access the marks from the higher mark ranges.

Access to the higher mark ranges depends on the students 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.

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 students 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

As has been the case with previous criterion, the students ability to generate valid evidence is very dependent on the quality of design brief they are working from.

The most frequently observed method of testing ideas was for students to model, in some format, their ideas. These included trialling manufacturing techniques and making mock-ups of the product. Students then used these models to offer some judgements about the aesthetic appeal of their design ideas.

This information was often evidenced in the form a surveys completed by the students' peers.

An example of a typical approach to recording the results of testing is shown below.

	Design Idea 1 (marks out of 10)	Design Idea 2 (marks out of 10)	Design Idea 3 (marks out of 10)
Appearance			
Cost			
Time to make			
Total Score			

This type of survey would be handed out to a number of people and the resulting totals presented.

This type of approach often lacks the objectivity and measurability required to access the higher mark ranges. Students need to be aware that their peers are rarely in a position to make objective evaluations over the merits of design ideas.

In order to access the higher mark ranges for this criterion students must provide measureable information in their design and manufacturing ideas from the previous criterion. For example detailing the sizes of alternative design proposals would allow material requirements, and hence costs, to be compared. Another example would be a student that considered producing graphic elements of a design using either a laser, or inkjet printer. Information published by printer manufacturers would allow an easy, objective comparison to be made of how long it would take to print, the relative cost of the equipment etc.

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. It is helpful to the moderation process when centres provide explicit evidence to justify the marks awarded.

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.

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. Reference to where these techniques were used in the students' evidence were also included.

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. Centres should note that including the content of a slide show (such as a PowerPoint presentation) in the students portfolio does not provide evidence that the presentation was actually delivered. In order to access the higher mark ranges there must be explicit evidence, usually in the form of witness testimony or photographs, of the actual delivery.

There was some evidence of students including information in their presentations that was included anywhere else in their portfolios. While this is not intrinsically a problem, it can be if marks awarded by the centre are for some of the other assessment criteria. Writing that is legible when viewed on a projector can sometimes be impossible to read when a PowerPoint presentation is printed out with six slides to a single A4 page. Centres should ensure creditable work is clearly presented for the moderator to inspect.

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 compared their final solution proposal to the initial client design brief / specifications, fewer then went on to seek feedback from the client. If the teacher acted as the client for the brief in the initial stages, providing feedback and evidencing this, may have been caused by logistical issues for centres.

Centres might consider developing a form for students to fill in which records their teachers' observations about their proposal. The student could determine several focused questions that require the teacher to comment about specific aspects of how their proposal addresses the original brief. In particular these questions should be constructed in such a way for the teacher to suggest areas that could be

modified or improved. The student would then be responsible for recording these comments. Subsequent to this the student could then go on to offer amended design proposals that attempt to address the areas identified by the teacher. This could be completed through the use of annotated sketches.

Grade Boundaries

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