Principal Moderator's Report

Summer 2016

Pearson Edexcel GCE in Design & Technology: Product Design, Resistant Materials (6RM01)

Unit 1: Portfolio of Creative Skills

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As a reminder of requirements in the 6RM01 course; students must produce a Portfolio of Creative Skills which is divided into three distinct sections, Product Investigation, Product Design and Product Manufacture.

In Product Investigation, they must select a product that contains at least two materials and is manufactured using more than one process. They are required to investigate the selected product under the headings performance analysis, materials and components, manufacture, and quality. Students, under teacher guidance have a complete choice in selecting appropriate products for investigation. Work can be presented in either A4 or A3 format.

In Product Design, students are required to submit at least one design task appropriate to AS levels of response that demonstrates their design competencies. They are encouraged to be as creative as possible and to support this there is no requirement for the designed product to be manufactured, which means there are no constraints placed on designs through the limitations of resources found in centres. Students have the option in Product Manufacture of making what they design.

In the course of designing, students are expected to produce a range of initial design ideas accompanied by technical annotation, a review of design ideas based on product specification requirements and development of designs into a final design proposal that includes enough detail to allow a skilled third party to manufacture the intended product.

Students, under teacher guidance have complete choice in selecting appropriate design briefs. Work should be presented in A3 format.

In Product Manufacture students are required to plan, make and test one or more products that match the manufacturing criteria of the task. If a single product is made, it must be manufactured using more than one material and process and if more than one product is produced, the collective group must contain more than a single material and process. In this section of the portfolio, it is strongly recommended that teachers set the manufacturing tasks in order to ensure that students improve competencies and learn new skills in preparation for A2 tasks. It is a rule that where CAM is used, it must not exceed 50% of product manufacture.

Where more than one product is made, planning and testing should only be evidenced once.

It is a requirement that clear photographic evidence is submitted that shows the quality and complexity of challenge relating to all manufacturing tasks.

Work in this section should be presented in A3 format.

It is expected that the complete Portfolio of Creative Skills will be presented using 25 – 30 sheets of A3 paper. There is no penalty for exceeding these guidelines.

This year, despite some excellent work being seen, where students scored high marks through outstanding standards in each section of their portfolio, overall standards appear to have slipped and much of the work presented was mediocre and formulaic. Some centres were recognisable by the same tasks being repeated year on year where work lacked freshness and excitement.

Assessment criterion (a)

In this section most students were able to score reasonably good marks, but the many could have gained more through a better selection of a 'similar product'. Many students selected products that were so similar, there was little opportunity to compare and contrast the pairings, which resulted in identical or very similar statements being made about both products.

The choice of 'similar product' is important in enabling students to make effective comparisons under specification headings, but if the similarity is too great, inevitably, form, function, user requirements, performance requirements etc will be the same or very close for each product.

Product pairings such as two cordless drills, two electric hand-held hairdryers, two ballpoint pens, two mobile phones, two wristwatches or two cycling helmets offer little opportunity to compare and contrast under the recommended specification headings.

More appropriate choices of products included cordless drill and pedestal drill, small reading lamp and large desk lamp, hand saw and circular saw, small electrical screwdriver and impact driver, and mortise chisel and mortising machine. These pairings offered much more opportunity to identify and discuss differences and how the products met their differing design needs while still being similar.

All students were able to write a specification for the product under investigation, but many did not qualify or justify statements. Saying that a hairdryer needed to be comfortable to hold or that a desk lamp needed to be adjustable are appropriate statements, but there should be an explanation of how these requirements are achieved within the design of the product.

Many students simply described products instead of justifying why specification points were relevant and the important areas of user requirements and performance requirements were often dealt with cursorily.

Where electronic devices such as mobile phones, iPads and tablets or cameras were investigated, students often focused on technical and electronic performance of Megapixels, Gigabytes etc. instead of form, function user/performance requirements etc.

Where a whole group of students analysed the same product many specification statements were the same or very close from student to student, defeating the purpose of this exercise.

The object of this section is to assist teachers in their teaching by encouraging a group of students to look at different products individually so that the information gathered through several analyses can be used in relevant and cohesive teaching, avoiding dry theory lessons.

Assessment criterion (b)

In this section students are required to investigate two materials used in the manufacture of the product under investigation and suggest one appropriate alternative for each.

In this section some students continued to consider both the primary product and the 'similar' one, which is incorrect. From this point onward, only the primary product should be investigated.

As was the case last year, almost all students were able to identify two appropriate materials and suggest viable alternatives. However, where plastics were involved, most suggestions were just another closely related plastic material.

A lot of students simply listed properties and cut and pasted generic information about materials without evaluating and justifying their suitability in meeting the design needs of the product. Some saw this as an opportunity to list everything they knew about materials without any selectivity.

In a significant number of instances students identified only a single advantage and disadvantage for each material identified and were rewarded highly by the centre assessor.

In centres where the same product was investigated by the whole student group, many statements were identical or had the same information rejigged. Suggestions for alternative materials were usually the same and tellingly, where inaccurate information was recorded by one student, this was often repeated by several. It was obvious in some cases that this and other sections were teacher led.

‘Environmental impact’ was addressed well by many students who discussed extraction, processing, refining, transportation, reuse and recycle. However, in a significant number of cases information was generic and limited to recycling without linking statements to the product under investigation.

Assessment criterion (c)

In this section students are required to identify and investigate two processes used in the manufacture of the product under investigation and to suggest one appropriate alternative for one of the identified processes.

This section contained the greatest discrepancies between centre marks and those of moderators, where inaccuracies were common and the information was generic.

Most students were able to identify two appropriate manufacturing processes and suggest an alternative for one, but many simply described a process and produced a generic list of advantages and disadvantages and did not relate these to the product to say how or why they met its design/manufacturing needs.

Where a product consisted of several component parts it was sometimes difficult to determine which parts were meant to be made using what process as this was not made clear.

Some students presented information on how materials from the previous section were manufactured rather than focusing on the manufacture of the product under investigation.

Some alternative processes were inappropriate, such as vacuum forming and blow moulding as substitutes for injection moulding.

Where there is no real alternative to a process such as injection moulding it is acceptable for students to suggest a process that would be appropriate if a different material were used, as long as they name the material; for example aluminium alloy and pressure die casting.

Environmental impact was often limited to energy use, or recycling of the product, rather than a discussion of the effects of using the process. Information was quite often the same as that presented in criterion (b).

Assessment criterion (d)

Most students were able to identify some appropriate quality control procedures, but quality assurance was very generic and not often related to the product.

Information about quality standards tended to just define the terms and not show how this was related to the product or how standards influenced the manufacture of the product. Some students simply described what QC was without specifying checks linked to their product.

The understanding of quality assurance continues to improve, but a significant number of students are unaware of requirements, resulting in general explanations of QA and confusion with QC. What is required under 'Quality assurance' could be presented in the form of a flow chart for example, using such sub-headings as Preparation; Processing; Assembly; Finishing and After-sales.

Assessment criterion (e)

Some students presented high quality, creative and innovative work in this section, but this was in the minority. The Product design section has been the most problematic for many students since the beginning of the 6RM01 course and this year was no different. Many students were leniently rewarded for simplistic design ideas and mediocre development.

Many students failed to embrace the design ethos and appeared to have decided what the solution to the design task would be within their first drawing, failing to explore other ideas. All students presented a range of ideas, but this often consisted of one detailed design plus two or three others that were included to fulfil assessment criteria requirements.

A lot of work was simply concept sketches or body styling, with little or no exploration of design details. Many students annotated to describe design features or details, but failed to illustrate how they might work. Technical annotation was often weak and did not reflect a good knowledge and understanding of materials and processes.

Reference to design criteria was not often in evidence and in some instances students presented no design criteria, or it was so superficial as to be useless in reviewing designs as they progressed.

Design development was excellent in some cases, but often limited to presenting construction details without any further design input taking place. There should be evidence of further design input as part of development and as a result of evaluation against design criteria.

Almost all students modelled their final design proposal, but some did so for superficial or cosmetic reasons, rather than to test some aspects of design detail.

Final evaluation against design criteria was often simplistic, especially when no measurable criteria had been set at the beginning of the design task.

Despite seeing some high quality work, most was uninspiring and in need of greater levels of creativity and knowledge of materials and processes. In the best work, it was obvious that teacher input had been influential in teaching design methodology, presentation techniques and in ensuring assessment requirements were met. Unfortunately there was also much evidence to suggest that many students had been left to their own devices in this section.

Assessment criterion (f)

As was the case last year some excellent standards of presentation were seen in this section, where all students used 2D and 3D CAD expertly. Many students still struggle with freehand sketching and this was present in many cases.

Modelling varied from precisely scaled replicas of the intended product to very loose 3D representations that could not be used in any constructive way to test aspects of designs. Many students still see modelling as an assessment necessity rather than a useful development tool.

Working drawings were included in almost all instances, but a large number were not detailed enough to enable 3rd party manufacture of the product. Where orthographic working drawings were generated automatically from 3D CAD sketches, dimensions were often recorded to two or three decimal places, making them unrealistic.

Assessment criterion (g)

This section was quite well done and students were able to produce an appropriate sequence of manufacturing operations, but in some cases tasks were not detailed enough to allow a third party to follow the plan. Planning statements should be detailed; the statement “cut rails to size” should include dimensions and quantities. Most students incorporated Gantt charts, flow charts, tables and further details of tools/processes and materials. Timings were sometimes given in lessons, weeks or dates, but these terms need to be clarified in minutes, hours or days.

Assessment criterion (h)

Once again, this year saw some excellent ‘making’, but as always some work was too simplistic and undemanding to reach the higher mark ranges.

Many centres set the making task and where this was done well students were able to demonstrate their capabilities in a wide range of skills and processes. However, there were too many centre generated tasks that did not offer the level of demand necessary to allow students to access the full range of marks.

As was the case last year, some centres could be recognised from the same making task they have set and used over several years, which must be unexciting for students pressed into a formulaic routine.

CAM equipment was used appropriately and the vast majority of centres understand the correct balance of no more than 50% usage in a practical outcome.

A continuing problem is that many students failed to justify the choice of materials used in their making tasks which meant that they were unable to achieve full marks despite demonstrating skills worthy of this level. This requirement is stated clearly as an assessment criterion statement.

Assessment criterion (i)

Many products lacked detailed testing against measurable manufacturing criteria, often due to limited criteria set at the beginning of manufacture, with some projects having no starting point.

Tests were not often carried out under realistic 'field trials' and third party testing often consisted of simplistic comments which did not evaluate the product and were not related to measurable performance criteria.

It is essential that three or four measurable performance criteria are set at the beginning of the making task, so that realistic and meaninful testing can be carried out on the finished product to test whether it is fit for purpose.

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