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A LEVEL

Moderators' report

DESIGN AND TECHNOLOGY: DESIGN ENGINEERING

H404

For first teaching in 2017

H404/03/04 Summer 2024 series

Version 1

Contents

Introduction

Our moderators' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

Online courses

We have created online courses to build your confidence in delivering, marking and administering internal assessment for our qualifications. Courses are available for Cambridge Nationals, GCSE, A Level and Cambridge Technicals (2016).

Cambridge Nationals

All teachers delivering our redeveloped Cambridge Nationals suite from September 2022 are asked to complete the Essentials for the NEA course, which describes how to guide and support your students. You'll receive a certificate which you should retain.

Following this you can also complete a subject-specific Focus on Internal Assessment course for your individual Cambridge Nationals qualification, covering marking and delivery.

GCSE, A Level and Cambridge Technicals (2016)

We recommend all teachers complete the introductory module Building your Confidence in Internal Assessment, which covers key internal assessment and standardisation principles.

Following this you will find a subject-specific course for your individual qualification, covering marking criteria with examples and commentary, along with interactive marking practice.

Accessing our online courses

You can access all our online courses from our teacher support website Teach Cambridge.

You will find links relevant to your subject under Assessment, NEA/Coursework and then Online Courses from the left hand menu on your Subject page.

If you have any queries, please contact our Customer Support Centre on 01223 553998 or email support@ocr.org.uk.

Would you prefer a Word version?

Did you know that you can save this PDF as a Word file using Acrobat Professional?

Simply click on **File > Export to** and select **Microsoft Word**

(If you have opened this PDF in your browser you will need to save it first. Simply right click anywhere on the page and select **Save as . . .** to save the PDF. Then open the PDF in Acrobat Professional.)

If you do not have access to Acrobat Professional there are a number of **free** applications available that will also convert PDF to Word (search for PDF to Word converter).

General overview

In similar fashion to the 2023 summer, we were delighted to receive and moderate some outstanding examples of iterative design in the development of a product, within the Product Design endorsed specification.

Candidates who did well generally:	Candidates who did less well generally:
• understood the iterative design journey • had regular contact with their user/stakeholders throughout their iterative design journey • developed their ideas through the use of both physical and digital prototyping methods • included electronic or mechanised outcomes.	• worked in a linear manner • did not have direct real time contact with users • demonstrated limited ideas and development.

Mandatory requirement – electronic portfolios
A reminder to centres that electronic portfolios are a **mandatory requirement** and A4/A3 style paper portfolios are no longer acceptable. The majority of centres either sent work via USB drive or uploaded work and associated forms directly to the new Submit for Assessment platform. Both of these work well, but the latter is more efficient.

Unencrypted USB drives are very helpful. If there is a need for a password, please choose a short clear password that does not have letters and numbers that can easily be mistaken for each other such as 1 or l, o or 0, for example.

Excessive file sizes can be a problem. Complex presentations that take a long time to load are counterproductive. Please would centres compress all electronic work before uploading; this is an absolutely fundamental step that centres should seek to undertake. There is no need for candidates to have 100+ slides in their portfolio.

Interactive dialogue is a vital component within the philosophy of this specification. However, there is **absolutely no requirement** for a presentation to have more than 15/20 videos embedded. We would not expect a candidate to have more than 10, and there is no requirement to have numerous videos on a single page/slide.

Many centres provided a separate folder containing **'clearly labelled'** videos, enabling most moderators to view all video files. It is **preferable,** however, that this facility is used as a **backup** as viewing videos in context is a far more valuable exercise. Where videos are unable to be embedded within a portfolio, it would be helpful for them to be directly hyperlinked to the source. A number of centres made effective use of externally hosted media within candidate portfolios to demonstrate stakeholder interaction, testing and other primary evidence. This reduced the number of excessive file sizes, keeping them manageable and easy to access. However, centres should be mindful that the moderator will need full access permissions for any externally hosted media as 'access was denied' on a number of occasions.

Centres should be aware that unless work is required for archiving or awarding purposes, then it is our intention to return **all work** that is sent at the end of the moderation series.

Please do not upload individual videos to the Submit for Assessment platform.

NEA Forms and Administration

Centres should be aware that there are only two forms that are required alongside candidate work: the Candidate Record Form **(CRF)** and the Candidate Declaration Form **(CDF).** The CDF must be signed by the respective candidate and teacher. The CRF is an **interactive form** that **correctly totals** candidate marks for each strand and avoids clerical errors. This form **should not** be completed by hand in pencil or pen. Centres are urged to use this **digital** form as it saves the moderation team many hours in chasing up on clerical errors that slow the moderation process a great deal.

The CCS160 (Centre Authentication Form) **should not be sent** in with the sample, it should be signed by all teachers involved and retained within the centre as required by JCQ.

Observations and comments on the CRF can be **very helpful**, particularly in indicating where levels had been met and criteria reached.

Marks must be uploaded by **May 15th** at the latest. Work must be sent/uploaded within three days of receipt of the sample request email. The moderation process is slowed down unnecessarily when moderators need to follow up on work/forms not received by this date. The support of centres is appreciated in addressing this in 2025.

Key Points

The purpose of the moderation process is to make sure that centre assessments are in line with a common national standard. This is achieved by adjusting any centre assessment where the moderation process indicates that this is necessary, based on the sample of work viewed. Centres receive a **detailed report** following moderation which identifies specific areas of the assessment criteria which need attention, where applicable.

In internally assessed units where the assessment contains many sections such as these ones, erring on the side of generosity in the assessment of some areas can have a **significant** cumulative effect.

We continue to ask that centres encourage their candidates to explore 'engineered' solutions that incorporate electronics/mechanisms or indeed to further solidify their technical understanding. There are many examples of impressive contexts being explored that include lots of mechanical opportunities, which in turn offer candidates the chance to apply mathematical content here too. Likewise there are also some superb coding examples and while we encourage the use and adaptation of sample code, in order to gain marks for programming/coding, candidates should be adapting and writing their own code to complete the task, etc.

Misconception

As we reported in the 2023 series, some centres are still using the mark scheme to create the slide titles and therefore follow a linear approach akin to the traditional style of research, design specification, design, develop, prototype and evaluate.

The philosophy at the very heart of this specification is that of iterative design. For example, while undertaking design ideas, candidates are encouraged to further explore by discussing concepts with their user/stakeholder or investigating materials/components or mechanisms to further their design and knowledge. Explore, create, and evaluate is cyclical. Evidence is often apparent throughout a candidate's portfolio and Criteria 1.6, for instance, would not be expected to appear until after the final design solution is finalised.

Strand by strand guidance on H404/5/6 03/04 Product Development requirements

The following is not an exhaustive list, and these comments relate directly to the A Level Specification which can be found on the OCR website. Chapter 10 *NEA Product Development* of the OCR AS and A Level Design & Technology textbook is particularly informative and extremely detailed.

Our live training which is specifically directed at the NEA and has many explicit aspects should also be utilised.

We urge you to use these resources, they have been compiled with numerous examples to aid delivery of the NEA.

This Product Development carries 100 marks.

Strand 1 - Explore

OCR suggests approximately 60 hours for completion of this non-exam assessment. This does not present a limit, but it is important to recognise that if candidates are producing excessive work that becomes irrelevant to the context and brief, or is not concise, then this is counterproductive and ultimately does not add to the experience they have, nor is it within the ethos of the specification.

The use of primary users/stakeholders is **fundamental** within this endorsed title. Candidates should continually revert to and have **direct** contact with their primary user/stakeholders in their explorations throughout. Use of a peer taking on the persona of a user is helpful if a user is not available. These interactions should be clearly evidenced within a candidate's portfolio. **Direct** contact should be in the form of real time/first-hand interactions so that the candidates can gain as much insight as is possible.

A broad range/contrast when exploring possible contexts offers candidates an opportunity to gain valuable insights and further understanding. Involving users/stakeholders in discussions at this stage can also be very useful.

Investigations that explore existing products are much more useful when products are analysed first-hand – disassembly of a broken or old product can be immensely helpful to the understanding of candidates.

The exploration of materials is best employed within the iterative design process and linked/related directly to the ideas/developments that are taking shape. Standalone slides on a list of **generic** materials that bear little relevance to the product chosen are of limited value.

Misconception – Iterative Design

Centres should not lead candidates through the project with generic slide layouts and a formulaic approach to the design process.

This approach can stifle candidate's innovation and creativity.

Misconception – Technical Specification

There appeared to be some misunderstanding of the technical specification. In essence, this should offer sufficient clarity for the manufacture of the intended design solution to a third party, so they are able to make a prototype of it themselves. Despite it being termed section 1.6, it actually sits just before manufacture. Working drawings are fundamental to this, as are details of bought in items and the choice of materials.

The technical specification should include circuit schematic diagram if the prototype includes electronics

Strand 2 – Create: Design Thinking

OCR encourages creative and innovative product developments that not only demonstrate a progressive (iterative) design process, but also take into consideration the feedback and requirements of primary users and other stakeholders. It may not always be possible for candidates to work with external people. but working with a member of staff or peer who can offer a realistic persona of the stakeholder is extremely important to offer sufficient feedback and support to the design process.

There were a significant number of candidates that simply fixated on a single idea and subsequently did not explore other ideas that may well have led to a more creative and educational experience for them. A wide range (we suggest 10) and variety of different ideas being presented offers candidates the opportunity to develop their ideas innovatively and with an open mind, in keeping with the iterative philosophy.

Ideas could be across a range of evidence to reflect the aspects of a design engineering project, such as systems diagrams, electronic circuit diagrams, codes, drawings and/or models of mechanisms including the use of construction kits, and drawings/CAD models of system enclosures/packaging.

Where centres clearly support the iterative design approach, that allowed candidates the freedom to be creative. With several progressive developments of either a whole idea or components within, then the outcomes were often exceptional, meeting the expectation for MB5 with ease. Three-dimensional development can be extremely useful.

2.2 Design Developments

Some development of ideas was demonstrated using a variety of methods, but this was often in a very linear fashion. Developing more than one idea is a fundamental aspect of the learning experience; please refer to our training materials for further support.

The quality of modelling was generally good and CAD was used extensively at the top end. Testing models in real time in their environment or a given context is still immensely valuable for the iterative design journey.

The use of technical language and understanding is expected when iteratively designing. Simply exploring the use of shapes without any aspirations to understand how the structure behind a given shape is derived or constructed is a missed opportunity at this level.

Strand 3 – Create: Design Communication

Different methods of communication and presentation should be encouraged. There is no expectation that an idea will begin its iterative journey as a sketch, although many candidates find this helpful. The start point is purposely fluid with sketch modelling and CAD being examples of well used techniques that are utilised as a start point.

When creating electronic systems, breadboarding and circuit CAD simulators can be used to effectively communicate ideas. For many candidates, construction kits can communicate mechanisms and movement far more effectively and quickly via the use of video evidence than sketches can.

It is essential that centres follow the submission guidelines set out in the specification for all evidence to be fully considered through moderation, for example, that file sizes are compacted wherever possible, and all videos and audio files are tested to make sure they are accessible from external devices.

The **real time** capture of findings and decision making is a crucial element of the NEA and impacts on several key aspects of the marking criteria.

Strand 4 – Create: Final Prototype(s)

Misconception – Planning for making

Planning should occur before the making process begins and cover all requirements and safety considerations identified from the technical specification. It should be relevant to making in a workshop at a centre. Timescales for the various processes are a helpful addition.

If evidencing the use of hand tools, machinery, digital design and/or digital manufacture throughout the project is limited, then centres should be marking in MB1 for 'Use of specialist tools and equipment'. If they have not evidenced one method and the rest of their work is strong, then marks cannot be given above MB2 for this statement. CAD/CAM is a **mandatory** element of this specification. It is also important to note that to achieve MB4 and beyond for Criteria 4.3 and 4.4, candidates should demonstrate effective and appropriate use. There were a significant number of impressive outcomes this year that demonstrated a high level of skill and accuracy from candidates. CAD was used effectively across a number of centres to clearly present final design solutions and technical specifications.

There should be sufficient video and photographic evidence of the final prototype(s) to assess or evaluate the quality, viability and/or success. Moderators must be able to view the final prototype with clarity. The quality of photographs, particularly of close-up work, is important. Where it has been deemed appropriate for a candidate to produce a scale model as their final prototype, appropriately scaled testing methods should be conducted to support marks given in the higher mark bands in order to determine the solutions viability and feasibility.

Moderators should also be able to clearly **see evidence** to suggest how the product could be viable for the intended market.

Strand 5 - Evaluation

Designing iteratively requires that ongoing analysis and evaluation of ideas/solutions is fundamental to a candidate's success. Centres should endeavour to instil a mind-set of **continual** refinement toward the most appropriate and advanced solution for the market and opportunity being designed for, and within the facilities and resources available.

The views from primary users/stakeholders in real time should be evident and/or evaluations of other's opinions in order to inform the next steps/progression of the design process.

Wider issues such as LCA and the impacts of the product more broadly are often overlooked.

Risk Assessment

Risk assessments had a very broad range of responses. Please do consider health and safety throughout the project. A risk assessment of the prototype product as it would be expected to be used is a very useful piece of work that can also highlight inadequacies that can be addressed as part of the further improvements that form part of Section 5.5. Candidates often overlook this important area within the actual use of their product.

Testing and analysis should be rigorous and objective. **Evidence** of the planning and implementation of this should be clearly presented. User/stakeholder testing should always be encouraged with feedback in **real time and in the intended environment for use** wherever possible.

Testing against technical and non-technical requirements is also very useful in identifying strengths and weaknesses, with the latter affording a direction for future modifications.

Further modifications and any opportunities to improve design optimisation are expected within this strand.

Final Points

Centre and candidate name and number must be on all work that is presented.

Slides need to be numbered to aid navigation for centre and moderation process.

Staff/peers acting in the role of user/stakeholder persona is a useful tactic, but this must be clearly articulated and referenced within the portfolio. All work undertaken **must** be by the candidate.

Acknowledging sources with a bibliography is very helpful. A number of candidates also made effective use of referencing external sources by hyperlinking any external images or data tables they had used as reference materials.

The overall ethos for this specification is based on 'real time recording' of events as they actually happen. Interactive dialogue involves discussing the selected product/comparative products/iterative development/ongoing analysis/evaluation and testing with others and responding to suggestions made. Evidence of interaction should be recorded in real time with the active comments of those involved recorded first hand and not retrospectively.

Re-typing of first hand comments is totally counterproductive and should be avoided.

Design Engineering (H404) focuses on consumer products and applications, and their analysis in respect of:

- Materials, components, process, and their selection and uses in products and/or systems
- The selection and use of the above in industrial and commercially viable products and practices.

Most common causes of centres not passing

Using generic contexts that do not allow candidates individual exploration of a given scenario or context.

Common misconceptions

1.3 Design Requirements have superseded the former Design specification – lots of detail within the training on offer.

Avoiding potential malpractice

Individual exploration of a context is crucial, and candidates should not share a pre-determined centre afforded context.

Helpful resources

It is strongly advised that centres make use of the subject-specific OCR resources and training events that are available through Teach Cambridge or generic guidance via our website.

Additional comments

There is a great deal of helpful training available – our training is updated every year and as such centres should make use of this resource. The live presentations with the opportunity to ask one of our most experienced moderators is particularly helpful.

Supporting you

Teach Cambridge

Make sure you visit our secure website **Teach Cambridge** to find the full range of resources and support for the subjects you teach. This includes secure materials such as set assignments and exemplars, online and on-demand training.

Don't have access? If your school or college teaches any OCR qualifications, please contact your exams officer. You can forward them this link to help get you started.

Reviews of marking

If any of your students' results are not as expected, you may wish to consider one of our post-results services. For full information about the options available visit the OCR website.

Access to Scripts

We've made it easier for Exams Officers to download copies of your candidates' completed papers or 'scripts'. Your centre can use these scripts to decide whether to request a review of marking and to support teaching and learning.

Our free, on-demand service, Access to Scripts is available via our single sign-on service, My Cambridge. Step-by-step instructions are on our website.

Keep up-to-date

We send a monthly bulletin to tell you about important updates. You can also sign up for your subject specific updates. If you haven't already, sign up here.

OCR Professional Development

Attend one of our popular professional development courses to hear directly from a senior assessor or drop in to a Q&A session. Most of our courses are delivered live via an online platform, so you can attend from any location.

Please find details for all our courses for your subject on **Teach Cambridge**. You'll also find links to our online courses on NEA marking and support.

Signed up for ExamBuilder?

ExamBuilder is a free test-building platform, providing unlimited users exclusively for staff at OCR centres with an Interchange account.

Choose from a large bank of questions to build personalised tests and custom mark schemes, with the option to add custom cover pages to simulate real examinations. You can also edit and download complete past papers.

Find out more.

Active Results

Review students' exam performance with our free online results analysis tool. It is available for all GCSEs, AS and A Levels and Cambridge Nationals (examined units only).

Find out more.

You will need an Interchange account to access our digital products. If you do not have an Interchange account please contact your centre administrator (usually the Exams Officer) to request a username, or nominate an existing Interchange user in your department.

Online courses

Enhance your skills and confidence in internal assessment

What are our online courses?

Our online courses are self-paced eLearning courses designed to help you deliver, mark and administer internal assessment for our qualifications. They are suitable for both new and experienced teachers who want to refresh their knowledge and practice.

Why should you use our online courses?

With these online courses you will:

- learn about the key principles and processes of internal assessment and standardisation
- gain a deeper understanding of the marking criteria and how to apply them consistently and accurately
- see examples of student work with commentary and feedback from OCR moderators
- have the opportunity to practise marking and compare your judgements with those of OCR moderators
- receive instant feedback and guidance on your marking and standardisation skills
- be able to track your progress and achievements through the courses.

How can you access our online courses?

Access courses from Teach Cambridge. Teach Cambridge is our secure teacher website, where you'll find all teacher support for your subject.

If you already have a Teach Cambridge account, you'll find available courses for your subject under Assessment - NEA/Coursework - Online courses. Click on the blue arrow to start the course.

If you don't have a Teach Cambridge account yet, ask your exams officer to set you up – just send them this link and ask them to add you as a Teacher.

Access the courses **anytime, anywhere and at your own pace**. You can also revisit the courses as many times as you need.

Which courses are available?

There are **two types** of online course: an **introductory module** and **subject-specific** courses.

The introductory module, Building your Confidence in Internal Assessment, is designed for all teachers who are involved in internal assessment for our qualifications. It covers the following topics:

- the purpose and benefits of internal assessment
- the roles and responsibilities of teachers, assessors, internal verifiers and moderators
- the principles and methods of standardisation
- the best practices for collecting, storing and submitting evidence
- the common issues and challenges in internal assessment and how to avoid them.

The subject-specific courses are tailored for each qualification that has non-exam assessment (NEA) units, except for AS Level and Entry Level. They cover the following topics:

- the structure and content of the NEA units
- the assessment objectives and marking criteria for the NEA units
- examples of student work with commentary and feedback for the NEA units
- interactive marking practice and feedback for the NEA units.

We are also developing courses for some of the examined units, which will be available soon.

How can you get support and feedback?

If you have any queries, please contact our Customer Support Centre on 01223 553998 or email support@ocr.org.uk.

We welcome your feedback and suggestions on how to improve the online courses and make them more useful and relevant for you. You can share your views by completing the evaluation form at the end of each course.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on
01223 553998

Alternatively, you can email us on
support@ocr.org.uk

For more information visit
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