

Design and Technology Progression Guide - Moving from GCSE to GCE and beyond

Introduction

The GCSE Design and Technology: Graphics Products and the GCE Product Design: Graphics Products are two specifications offered by Edexcel that provide centres with a progression from one Graphic Products qualification to another. With these qualifications there is a smooth transition from GCSE through AS Level to A2. As the specifications are progressive there are a number of factors that a centre can take into account, to ensure this smooth transition from one qualification to another.

Theoretical Knowledge

There are some overlaps of theoretical knowledge between the GCSE and AS and A2 units with the majority of these overlaps coming between the GCSE specification and the AS sections of the GCE specification.

(An example of how student responses would change at the different levels is given later in this document).

Centres are reminded that the key documentation in all these qualifications are the relevant Specifications as published by Edexcel. At both the GCSE and GCE levels, the theoretical knowledge elements of the specifications are laid out in a very similar way in sections under distinct headings. In both the GCSE and the GCE Specifications the wordings of the key sentences at the start of each section, the stems, are very similar, but, when looking at the actual content of the material, teachers will see that the essence of the subject matter varies slightly from one specification to another. For example, in the **Materials** section of the GCSE, Specification, students are required to study the:

“Aesthetic, functional and mechanical properties, application and advantages and disadvantages of the following paper and board in the production of graphic products and commercial packaging”

Whereas at AS Level (Unit 2), students are required to learn:

“Aesthetic, functional and mechanical properties, application and advantages and disadvantages of the following common paper, card and board for commercial and everyday use”

The wording is different but in essence the body of knowledge remains the same. The knowledge of the following paper, cards and boards are then required in both specifications:

- cartridge paper
- tracing paper
- folding boxboard
- corrugated board



- solid white board
- foil-lined board.

At GCE level, students are expected to know and understand these materials at a far deeper level than at GCSE. The GCE examiners are expecting to see in the AS responses well **justified** statements of how and why these particular materials might be used in graphics products. At GCSE, the responses given by students would not be as deep and may well be more of a personal understanding whereas, GCE students might well refer to industrial situations and how these materials might be used on a larger commercial scale.

When it comes to the materials that are often used in the creation of models and prototypes, the wording in the specifications is in fact identical. In both the GCSE and AS Specifications, it reads as follows:

“Aesthetic, functional and mechanical properties, application and advantages and disadvantages of the following metals/ polymers/woods for the creation of models and prototypes”

Knowledge of the following materials is then required in both specifications:

- Metals
 - Ferrous – steel
 - Non-ferrous – aluminum and tin
- Polymers
 - Acrylic
 - Polyethylene terephthalate (PET)
 - Polyvinyl chloride (PVC)
 - Polypropylene (PP)
 - Polystyrene (PS) rigid (high density polystyrene) and expanded
 - Styrofoam™
- Woods
 - Hardwoods – jelutong and balsa
 - Softwood – pine
- Composites
 - Carbon fibre
 - Medium density fibreboard (MDF).
- Modern and Smart Materials
 - Thermochromic liquid crystals/film
 - Liquid crystal displays (LCDs)

The key issue with these materials is that the student’s attention should be drawn to the stem of the materials section. Although the wording is identical in the stem they should be reminded that a far greater depth of knowledge and understanding of materials is required at GCE. The AS students should **justifying and explain** and again refer more to industrial and commercial situations rather than school workshop experience when responding to questions in the examination paper.

The specifications then move onto **components** that might well be required in Graphic Products. The GCSE and AS Specifications require students to study:

“Processes, applications and advantages/disadvantages of the following binding methods for Graphic Products in relation to both paper and card”

- spiral/comb binding
- saddle-wire stitching
- perfect binding
- hardbound or case-bound.

The above are the only specifically mentioned elements that both GCSE and GCE students are required to have a knowledge and understanding in the components section. One factor that is worth mentioning is that in the GCSE element that deals with components, there is a requirement for students to know and understand how to use correctly technical drawing equipment. This is not specifically required at GCE and no questions would be asked about technical drawing aids in any GCE, AS or A2 examination paper. However, there is an assumption that at GCE students should know how to use these tools. There is every possibility that a knowledge and understanding of drawing equipment could be required in an examination question and in the coursework elements of both AS and A2 when preparing working drawings. Even if work is produced using a CAD programme, it is implicit that a student has knowledge of how drawings are produced.

Students in any Design and Technology course must have an understanding of **Scale of Production**. In both GCSE and GCE students are required to have this knowledge. However, there is one slight difference between the two specifications that does need to be clarified. The GCSE Specification stem for Scale of Production is as follows:

“Characteristics, application and advantages/disadvantages of the following scales of production in the manufacture of graphic products”

The GCE is subtly different, as at the end of the sentence it changes to:

“.....the manufacture of products”

One important factor to remember with the GCE Specification, is that it is part of a suite entitled, **“Product Design”** therefore in some instances the student is not always restricted to using just graphic products. In reality, the majority of questions in and GCE Graphics Product paper will be related to graphics. However, at AS and A2 level, should a candidate refer to a resistant materials issue in their paper they will not be penalised.

Knowledge of the following scales of production is required in both levels:

- one-off
- batch
- mass.

Modelling and prototyping are an important part of working in Graphic Products. Indeed in both GCSE and GCE, students are required in their coursework projects to produce models.

Progression document

GCSE Design and Technology: Graphic Products to GCE Product Design: Graphic Products

Modelling and prototyping also appears in the theory element of both levels. Students are required learn about:

“Processes, applications and advantages/disadvantages of the following 2D/3D models and prototypes to aid the development of graphic products”

One thing to note is that at GCSE, students are required to think about two-dimensional and three-dimensional models whereas at GCE, they are only required to look at three-dimensional. The following are stated in both specifications:

- block modeling of medium density fibre board (MDF) and Styrofoam™
- rapid prototyping using stereolithography (SLA) and 3D printing (3DP)
- blow molding.

Students at all levels are required to have a good understanding of **forming** methods. In both specifications the wording is again identical; students need to learn:

“Characteristics, preparation, processes, application and advantages/disadvantages of the following methods for the batch and mass production of graphic products and components”

The specifications then go onto state three similar subjects that need to be covered:

- blow moulding
- injection moulding
- vacuum forming.

In the Joining Techniques part of the specifications, the stem is again identical. All four of the techniques mentioned at GCSE are again mentioned at GCE. They are:

- epoxy resin
- polystyrene cement
- tensol® cement
- polyvinyl acetate (PVA).

When it comes to **finishing** techniques, again the wording in the stem is identical for both GCSE and GCE. The following are required at both levels:

- laminating
- varnishing
- hot-foil blocking.

With the **printing** processes, the wording in the stem of the two specifications varies. With the GCE, the word “commercial” has been added. That is important, because the emphasis of this element of the specification is clearly linked to “Scale of Production”. (There is also a link here with the A2 project work as that is very much geared to the commercial production of graphic products).

The areas that need to be studied in both instances are:

- offset lithography
- flexography
- gravure

- screen printing.

All the theoretical elements mentioned so far have been a comparison between GCSE and the AS Level GCE. The final two sections, those of **Information and Communication Technology (ICT)** and **Environmental Issues** appear in the GCSE Specification and are contained within the A2 part of the GCE Specification. This is an important point, because there is an expectation that candidate responses at A2 are at a higher level than AS.

With the ICT sections in the specifications there is again a subtle difference between the GCSE and the GCE stems. The GCE specification specifically has reference to “**the global market**”. This does appear in the GCSE specification. The GCSE Specification just states:

“**Characteristics, processes, applications and advantages/disadvantages of ICT in the design, development, marketing and sale of graphics products**”

The following are then repeated in both Specifications:

- e-mail
- electronic point of sale (EPOS) in the retail and manufacture of products
- internet marketing and sales.

The responses expected are therefore expected to be deeper than those at GCSE, and indeed at a higher level than those expected at AS, and should be directly related to the global market.

The final area of study that appears in both the GCSE and GCE is the issue of **sustainability and conservation**. Although the headings of the two levels do not always directly correspond, the essence of the subject matter does appear at both GCSE and GCE. The following are part of both specifications:

- reduce materials and energy
- reuse materials and products where applicable
- recover energy from waste
- recycle materials and products or use recycled materials
- wind energy using turbines and wind farms
- solar energy using solar cells and photovoltaic cells
- biomass converted into biofuels for transportation
- reducing greenhouse gas emissions through the Kyoto Protocol.

Practical Tips when approaching questions

When a student moves from GCSE to AS and then to A2, the way in which they are expected to respond at different levels varies. As candidates move through the qualifications the answers produced by students should be more complex demonstrating a deeper knowledge and understanding of the subject matter.

For instance, taking **vacuum forming**, one of the processes mentioned in the “**forming methods**” sections of both the GCSE and AS Specifications as an example. At GCSE a response that included a description of vacuum forming would be sufficient to gain credit. This description might include basic statements describing the vacuum forming process. A

candidate might state that a mould is made and then heated thermoplastic is sucked over the mould. The plastic is left to cool and the finished product is removed from the vacuum-forming machine. At this level, a student might well have used the vacuum-forming machine in class and a description of that experience would suffice to gain the marks.

At GCE Level however, the student would be expected to include not only the factors mentioned in the GCSE response but would be required to add extra details. A candidate would need to mention more detailed information including such factors as draft angles, and the importance of having slopes on moulds to ensure the easy removal of the thermo-plastic. The student would also be expected to discuss the problems of undercuts. The final response would be a far more technical piece of work.

It is very important to realize that to gain ultimate success at GCE requires the extra piece of knowledge and information.

The GCSE and GCE papers are marked via the Internet using a secure system. Because of this system, the examination papers for both qualifications are laid out in a very similar way. The questions and the candidate responses are contained within the same paper; centres do not need to hand out sheets of lined paper and there should be no need for extra sheets to be given out. The spaces provided for the responses have been carefully worked out so that there is the right amount of room available. This also means that there should be no reason for students to write in the margins of papers. Where candidates are asked to produce diagrams, again there should be enough space for the response without the candidate going over the lines and into the margin.

In both the GCSE and GCE papers there are particular things that a candidate needs to look out for when they are reading the questions.

Firstly, a candidate should look at what are referred to as **command** words. Usually in a question, a stem is written to set the scene and then the questions appear following the stem. The questions nearly always start with a command word.

These command words are similar at both GCSE and GCE. They are:

Command word	Marks awarded	Description
Give/State/Name	1 Mark	These types of questions will usually appear at the beginning of the paper or question part and are designed to ease students into the question with a simple statement or short phrase.
Describe/Outline	2+ Marks	These types of questions are quite straightforward. They ask students to describe something in detail. Some questions may also ask students to use notes and sketches. They can gain marks with the use of a clearly labelled sketch.
Explain/justify	2+ Marks	These types of questions are asking students to respond in detail to the

		question. No short phrases will be acceptable here. Students must make a valid point and then develop or justify it to gain full marks.
Evaluate/discuss/compare	4+ Marks	These questions are designed to stretch and challenge students. They will always be awarded the most amount of marks because they require students to make well-balanced arguments that usually involve both advantages and disadvantages. Because the papers are ramped, the Evaluate /discuss/compare question, because they always carry the most marks are usually at the end of a paper.

The questions and the papers at both GCSE and GCE are ramped. That is, as the candidate moves through the paper the questions become progressively harder. This ensures a progression through the GCSE papers and then through the AS and A2 levels.

On both the GCSE and the GCE question papers, at the end of each sub-section, the number of marks allocated to that particular section is given. This helps to guide the candidate into giving some indication of the number of points that will need to be made in that particular section. For example, if the number of marks is indicated thus: (4) and the question has the command word “justify” the response expected would be “the point given (1) and three justification points (1) + (1) + (1) = 4 marks in total”.

Coursework

Both GCSE and GCE have coursework elements within their respective specifications. With the GCSE Design and Technology: Graphics Products and the GCE Product Design: Graphics Products students are required to select the areas they are going to produce work for from lists provided by Edexcel that are included in the relevant Specifications.

With both the GCSE and the GCE Graphics Product Specifications the coursework tasks must be chosen from one of two given pathways. Those pathways are either **conceptual design** or the **built environment**.

- 1 Conceptual design incorporates a wide range of 3D products with associated graphics, for example:
 - packaging design
 - product/industrial design
 - Point-of sale-display
 - vehicle design.

Or

- 2 The built environment focuses on the manmade surroundings that provide the setting for human activity, for example:

- architecture
- interior design
- exhibition design
- theatre sets
- garden design.

GCSE Coursework	AS Coursework	A2 Coursework
<ul style="list-style-type: none"> • Analysis of brief • Research • Specification • Design • Review • Communication • Develop • Final Design • Plan • Make • Quality • Health and Safety • Test and Evaluate 	<p>Product Investigation</p> <ul style="list-style-type: none"> • Performance analysis • Materials and/or components • Manufacture • Quality <p>Product Design</p> <ul style="list-style-type: none"> • Design and development • Communicate <p>Product Manufacture</p> <ul style="list-style-type: none"> • Production plan • Making • Testing 	<p><i>Commercial Design</i> <i>Own choice with a client</i></p> <ul style="list-style-type: none"> • Research and Analysis • Product Specification • Design • Review • Develop • Communicate • Planning • Making: use of tools/quality/complexity • Testing and Evaluating

The table shows the areas that need to be included in the various coursework tasks at GCSE, AS and A2. Although the headings of the various sections are slightly different, it can clearly be seen that the elements expected for the various qualifications are broadly similar. All specifications require analysis, product specification, design, make and test and evaluate activities.

At all levels, work is marked in centers by teachers and then moderated by Edexcel.

GCSE Coursework

Students studying for the GCSE Design and Technology: Graphics Products Specification are required to produce a coursework project that is derived from a list of tasks published by Edexcel. These tasks will appear each year on the Edexcel website. Students are then required to produce their work under controlled conditions. Details of the controlled conditions required are published in the Specification.

Students are required to complete a design and make activity. These activities can be linked in a “traditional” design and make project or they can design one thing and make another. The choice of which direction students take will probably be up to the teachers in the centres. Whatever route is chosen, either is a sound basis for the later AS and A2 coursework tasks.

If students produce a traditional design and make project, it will be a sound foundation for the A2 project at GCE and if they go down the separate design and make route, it will be a good foundation for the AS element of the GCE course.

At GCSE, students should be encouraged to develop high quality designing skills and high quality making skills.

The GCSE coursework, whichever approach is taken is a good basis and preparation for the next stage, the AS level coursework assignments. It is a good introduction to the high standard of design and making and helps potential GCE students to approach a variety of different design and make techniques in both two and three dimensions.

AS Coursework

The AS coursework is divided into three specific areas: Product Investigation, Product Design and Product Manufacture. The choice of Product Investigation and Product Design is up to the teacher. They may beset the tasks by the teacher or students may choose their own.

Students are expected to undertake a thorough Product Analysis of a product or a number of products. What is important to note here is that the products being analysed **do not** have to be limited to graphics products. As previously mentioned, the GCE course is part of the Product Design suite of qualifications and the product analysis can be of any product. Some exemplar material for this part of the course appears on the Edexcel website at <http://www.edexcel.com>.

The designing element of the AS qualification can be a “blue sky” design project. The idea is for the design experience of GCSE to be built upon. Students should be encouraged to produce busy design pages. They should move on from the, sometimes seen, Key Stage 3 and GCSE “three initial ideas - develop one idea” approach. Students should be encouraged to have a more integrated approach to their designing. This is designed to “bridge the gap” between GCSE and A2 where a professional designing approach is expected.

The make exercise is designed to develop student’s making skills. The ‘making task’ **must** be set by the teacher. Again this task directly follows on from the GCSE standard and is building on that knowledge ready for moving onto GCE. Here the students are expected to produce high quality three-dimensional graphic projects in accordance with the one of the chosen areas.

A2 Coursework

The A2 Coursework is a full-blown design and make activity. When compared to the GCSE design and make project, the major difference between that and the A2 project is that the A2 project must have a “client”. It should be a project that is intended for commercial production. The thing to remember in this project is that the client must be seen to be taking an active part in the process. They must be kept informed of how the work is going and they should be referred to and evidenced throughout the portfolio of work. Ideally, there needs to be copies of emails or letters or notes of meetings included in the student’s folder.

In the A2 projects the moderators are looking for a high level of work. Design and Development pages should be full of ideas. The pages need to be busy, with evidence that ideas are “tumbling out” of the designer’s head. There should be reference to industrial and commercial practices and evidence of how the product should be manufactured on an industrial scale.

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GCSE Design and Technology: Graphic Products to GCE Product Design: Graphic Products

When it comes to the practical work, the final piece should show “high level making skills”. There should be two things evident where the making is concerned. Firstly, there must be a production plan: how is this going to be produced by the student. It is very important that this is looking forward and not retrospective. Secondly, there must be evidence of manufacture. Use digital photography to record the making of the product.

The final part of this activity is the testing and evaluation. This section must be carried out honestly, with reference to the client and their original design specification. Students must not be afraid of stating that there were problems or some things did not go quite as well as they should have done. If there have been problems, students should admit to them and then suggest ways in which those problems could be cured or the design improved.

When it comes to the GCC coursework, the moderators are looking for a high standard of creativity and a high standard of finish in student’s work.

With all the Graphic Products courses, both at GCSE and GCE the candidates should be aware of the need to go down the two-dimensional and three-dimensional routes.

Resources

There are a number of sources that are available for the teachers of Graphic Products specifications. Edexcel have on their website for GCSE Design and Technology: Graphics Products and the GCE Product Design: Graphics Products a number of teacher guides and exemplar material. See: <http://www.edexcel.com> and follow the links to the various subject specific pages.

Internet:

There are a number of good websites that can help students with Graphic Products. It is quite useful to Google “Design and Technology: Graphic Products”, quite a few sites come up. The following are particularly useful:

<http://www.design-technology.info/graphics/default.htm>
<http://www.gglover.co.uk/graphics/>
<http://www.designandtech.com/graphics/>
<http://www.helenhudspith.com/graphics.html>

Books:

The following are the books that have been written to go with the Edexcel GCSE Design and Technology: Graphics Products and the GCE Product Design: Graphics Products courses:

Edexcel GCSE Design and Technology Graphic Products Student Book (Paperback)
Jon Atwood

GCE A level Design and Technology: Product Design - Graphic Products
Edexcel