Course/Unit Support Notes

Advanced Higher Design and Manufacture Course/Unit Support Notes

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Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

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Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Advanced Higher Design and Manufacture Course. Although primarily intended for teachers and lecturers who are delivering the Course and its Units, it may be useful to share some aspects with learners.

These support notes cover both the Advanced Higher Course and the Units in it.

The Advanced Higher Course/Unit Support Notes should be read in conjunction with the relevant:

Mandatory information:

- Course Specification
- Course Assessment Specification
- Unit Specifications

Assessment support:

- Specimen and Exemplar Question Papers and Marking Instructions
- Exemplar Question Paper Guidance
- Guidance on the use of past paper questions
- Coursework Information:
  - General assessment information
  - Coursework Assessment Task*
- Unit Assessment Support*

*These documents are for assessors and are confidential. Assessors may access these through the SQA Co-ordinator in their centres.

Related information
Advanced Higher Course Comparison

Further information on the Course/Units for Advanced Higher Design and Manufacture
This information begins on page 19 and both teachers and learners may find it helpful.

Equality and inclusion

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Course/Unit Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Course.

It is important that centres are aware of and understand SQA's assessment arrangements for disabled learners, and those with additional support needs, when making requests for adjustments to published assessment arrangements. Centres will find more guidance on this in the series of publications on Assessment Arrangements on SQA's website: www.sqa.org.uk/sqa/14977.html.

The greater flexibility and choice in Advanced Higher Courses provide opportunities to meet a range of learners' needs and may remove the need for learners to have assessment arrangements. However, where a disabled learner needs reasonable adjustment/assessment arrangements to be made, you should refer to the guidance given in the above link.

General guidance on the Course/Units

Aims

The aims of the Course are to enable learners to:

- develop understanding and skills in the processes of designing for the manufacture of products in commercial and industrial contexts
- develop and apply an understanding of the factors which influence thinking for product design and manufacturing activities
- develop a critical and visual awareness associated with requirements for user interface and product detailing
- develop independence in learning and enquiry skills in the context of problem solving in designing and manufacturing
- develop economic, social and environmental awareness of the implications of a product's design through its life cycle

Progression

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by Higher Design and Manufacture or equivalent qualifications and/or experience:

Learners who have achieved this Advanced Higher Course may progress to further study, employment and/or training. Opportunities for progression include:

- Progression to other SQA qualifications
  - Progression to other qualifications at the same level of the Course, for example Professional Development Awards (PDAs) , Higher National Certificates (HNCs)
- Progression to further/higher education
  - For many learners a key transition point will be to further or higher education, for example to Higher National Certificates (HNCs)/Higher National Diplomas (HNDs) or degree programmes. Examples of further and higher education programmes that learners might progress to are a range of design and/or manufacturing-related qualifications.
  - This Course provides good preparation for learners progressing to further and higher education as learners doing Advanced Higher Courses must be able to work with more independence and less supervision. This eases their transition to further/higher education. Advanced Higher Courses may also allow 'advanced standing' or partial credit towards the first year of study of a degree programme.
  - Advanced Higher Courses are challenging and testing qualifications — learners who have achieved multiple Advanced Higher Courses are regarded as having a proven level of ability which attests to their

readiness for higher education in HEIs in other parts of the UK as well as in Scotland.

- Progression to employment
  - For many learners, progression will be directly to employment or work-based training programmes. Examples of employment opportunities and training programmes are careers in design and/or manufacturing design fields.

This Advanced Higher Design and Manufacture Course could be part of the Scottish Baccalaureate in Science or Expressive Arts. The Scottish Baccalaureates in Expressive Arts, Languages, Science and Social Sciences consist of coherent groups of subjects at Higher and Advanced Higher level. Each award consists of two Advanced Highers, one Higher and an interdisciplinary project that adds breadth and value, helping learners to develop generic skills, attitudes and confidence that will help them make the transition into higher education or employment.

Hierarchies

Hierarchy is the term used to describe Courses and Units which form a structured progression involving two or more SCQF levels.

- This Advanced Higher Course is not in a hierarchy with the corresponding Higher Course or its Units.

Skills, knowledge and understanding covered in this Course

This section provides further advice and guidance about skills, knowledge and understanding that could be included in the Course.

Teachers and lecturers should refer to the *Course Assessment Specification* for mandatory information about the skills, knowledge and understanding to be covered in this Course.

The development of subject-specific and generic skills is central to the Course. Learners should be made aware of the skills they are developing and of the transferability of them. It is the transferability that will help learners with further study and enhance their personal effectiveness.

The list below shows the skills, knowledge and understanding that will be developed throughout the Course. There will be opportunities to develop these across the Units in the Course. However, the delivery mode adopted and the approaches to learning and teaching will determine how and where the opportunities arise.

The Course will develop skills, knowledge and understanding in:

- analysing often complex aspects and activities which surround and support commercial product design and manufacture in developing, synthesising and presenting effective proposals
- exploring contemporary techniques for three-dimensional visualisation of solutions in product design and manufacturing activities
- applying a range of techniques for visualising, modelling, testing and evaluating design proposals
- developing skills, techniques and strategies for communicating ideas appropriate to a range of audiences and users
- developing knowledge and understanding of the role of product design and manufacturing in contributing to a global economy
- developing a critical understanding of factors which influence and support commercial product development — past, present and future
- applying ethical, social, and environmental considerations in the decision-making process of product design and development
- planning, managing and undertaking a significant design and manufacture project

Skills, knowledge and understanding to be included in the Course will be appropriate to the SCQF level of the Course. The SCQF level descriptors give further information on characteristics and expected performance at each SCQF level (www.sqa.org.uk/scqf).

Approaches to learning and teaching

Advanced Higher Courses place more demands on learners, as there is a higher proportion of independent study and less direct supervision. Some of the approaches to learning and teaching suggested for other levels (in particular, Higher) may also apply at Advanced Higher level but there will be a stronger emphasis on independent learning.

For Advanced Higher Courses, a significant amount of learning may be self-directed and require learners to demonstrate a more mature approach to learning and the ability to work on their own initiative. This can be very challenging for some learners, who may feel isolated at times, and teachers and lecturers should have strategies for addressing this. These could include, for example, planning time for regular feedback sessions/discussions on a one-to-one basis and on a group basis led by the teacher or lecturer (where appropriate).

Learners should be encouraged to use an enquiring, critical and problem-solving approach to their learning. Learners should also be given the opportunity to practise and develop research and investigation skills and higher-order evaluation and analytical skills. The use of Information and Communications Technology (ICT) can make a significant contribution to the development of these higher-order skills as research and investigation activities become more sophisticated.

Learners will engage in a variety of learning activities as appropriate to the subject, for example:

- researching information for their subject rather than receiving information from their teacher or lecturer
- using active and open-ended learning activities such as research, case studies and presentation tasks
- making use of the internet to draw conclusions about specific issues
- presenting findings/conclusions of research and investigation activities in a presentation
- participating in group work with peers and using collaborative learning opportunities to develop teamwork
- drawing conclusions from complex information
- using appropriate technological resources, using appropriate digital media resources
- demonstrating development, improvement and refinement of techniques and practices
- using real-life contexts and experiences familiar and relevant to young people to meaningfully hone and exemplify skills, knowledge and understanding
- participating in field trips and visits

Teachers/lecturers should support learners by having regular discussions with them and giving regular feedback. Some learning and teaching activities may be

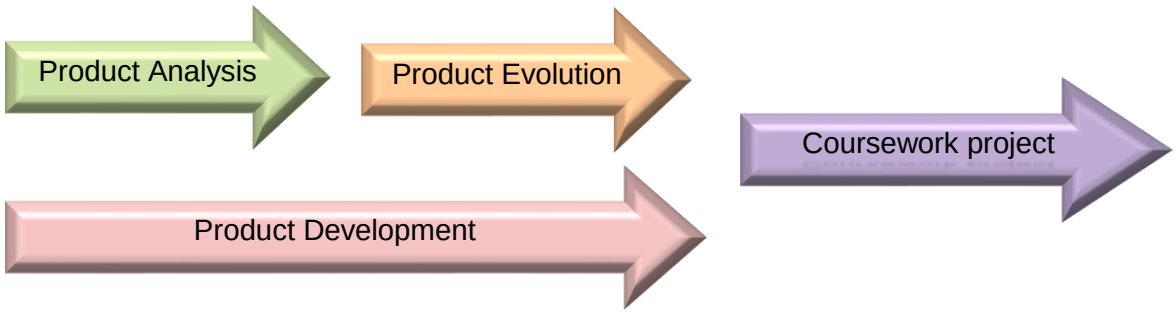
carried out on a group basis and, where this applies, learners could also receive feedback from their peers.

Teachers/lecturers should, where possible, provide opportunities to personalise learning, enabling learners to have choices in approaches to learning and teaching. The flexibility in Advanced Higher Courses and the independence with which learners carry out the work lend themselves to this. Teachers/lecturers should also create opportunities for, and use, inclusive approaches to learning and teaching. This can be achieved by encouraging the use of a variety of learning and teaching strategies which suit the needs of all learners. Innovative and creative ways of using technology can also be valuable in creating inclusive learning and teaching approaches.

Approaches to structuring the Course

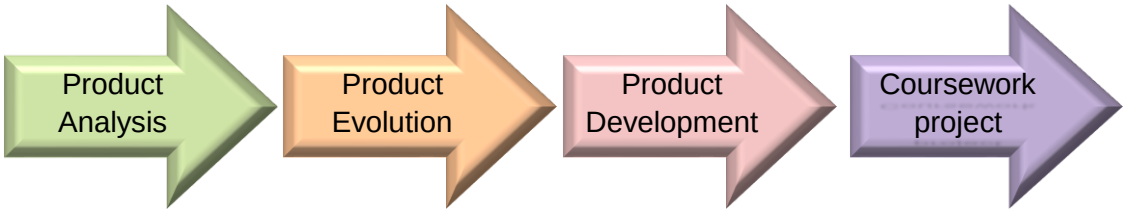
Centres are free to sequence the teaching of the Outcomes, Units and/or Course in any order they wish. It is unlikely that Units will be combined.

Example 1 — Concurrent model



When the concurrent model (shown above) is followed, the intention is not to integrate the Units, but to allow for the continual development of design skills throughout the year. This approach is more natural and allows the learners to keep skills current. In this case centres should ensure that they have provided enough time for the Course project to be completed and are reminded that it will be a significant piece of work requiring an extended period of time for completion.

Example 2 — Sequential model

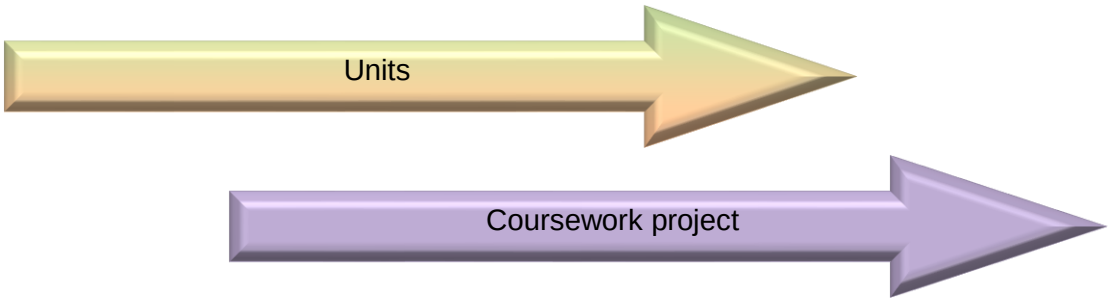


When a sequential approach is undertaken the *Product Analysis* and *Product Evolution* Units can be placed in any order, but it is suggested that the *Product Development* Unit is placed after either of the other two Units. This will potentially allow the learners to build on work from their *Product Analysis* or *Product Evolution* and provide a natural starting point. In this case, centres should ensure

that they have provided enough time for the Course project to be completed and are reminded that it will be a significant piece of work requiring an extended period of time for completion.

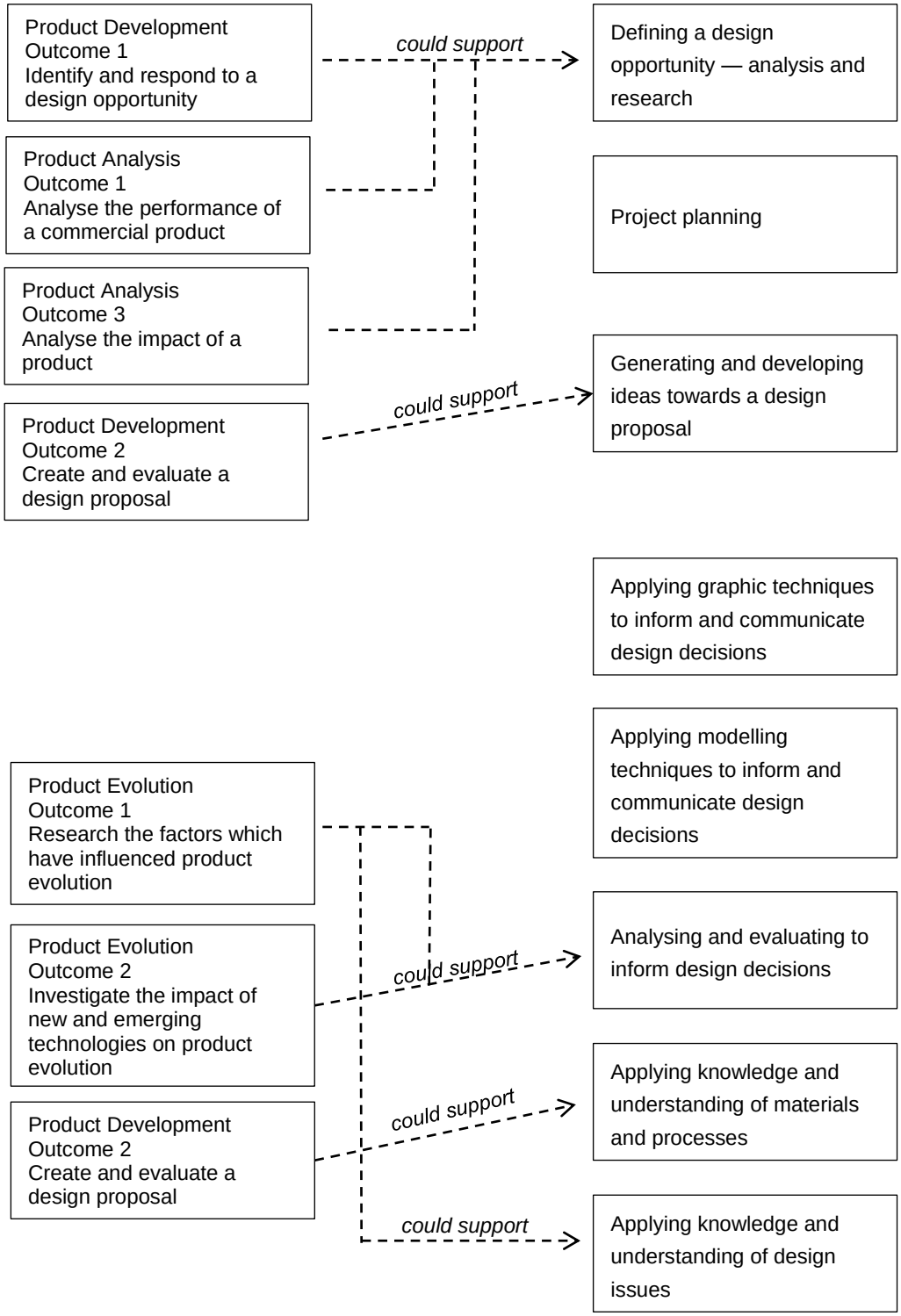
Example 3 — Concurrent delivery of Units and Coursework project

Regardless of whether examples 1 or 2, or other approaches to Unit delivery are adopted, it may be beneficial for the learner to begin working on their project soon after the start of the Course. This would involve working on aspects of their project in parallel with the learning from within the Units. Detailed information is provided within the Unit Assessment Support package (combined approach) issued by SQA.

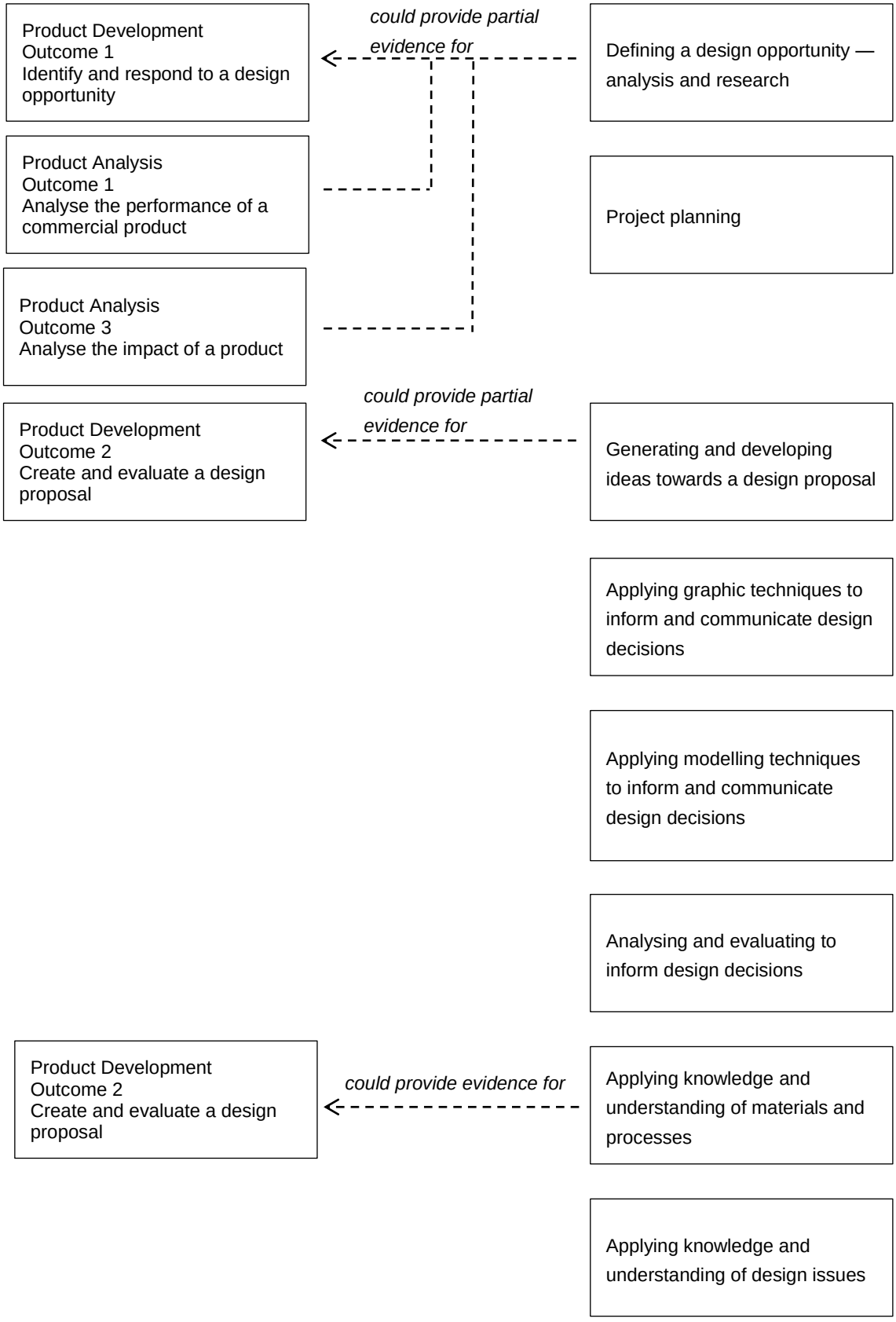


The diagrams below summarise the relationships between Unit assessment and Coursework project, indicating how it may be possible to provide an integrated approach to assessment if using an approach to Course delivery similar to example 3 above.

Units supporting Coursework



Project supporting Unit evidence



Developing skills for learning, skills for life and skills for work

Details of these skills can be found in the Course Specification and the Unit Specifications for this Course.

Approaches to assessment

Assessment in Advanced Higher Courses should reflect the investigative nature of Courses at this level, together with high-level problem-solving and critical thinking skills and skills of analysis and synthesis.

This emphasis on higher-order skills, together with the more independent learning approaches that learners will use, distinguishes the added value at Advanced Higher level from the added value at other levels.

There are different approaches to assessment, and teachers/lecturers should use their professional judgement, subject knowledge and experience — as well as their understanding of their learners and their varying needs — to determine which are most appropriate and, where necessary, to consider where workable alternatives are required.

Assessments must be fit for purpose and should allow for consistent judgements to be made by all teachers/lecturers. All assessments should be conducted in a supervised manner to ensure that the evidence provided is valid and reliable.

Unit assessment

Units will be assessed on a pass/fail basis. All Units are internally assessed against the requirements shown in the *Unit Specification*.

Assessments must ensure that the evidence generated demonstrates, at the least, the minimum level of competence for each Unit. Teachers/lecturers preparing assessment methods should be clear about what that evidence will look like.

Teachers/lecturers should refer to the following documents to ensure that all the requirements of Unit assessment are met:

- *Advanced Higher Design and Manufacture: Product Analysis Unit Specification*
- *Advanced Higher Design and Manufacture: Product Development Unit Specification*
- *Advanced Higher Design and Manufacture: Product Evolution Unit Specification*
- *Unit Assessment Support package 1: portfolio approach*
- *Unit Assessment Support package 2: Unit-by-Unit approach for each Unit*
- *Unit Assessment Support package 3: combined approach*

Unit Assessment Support packages are available on SQA's secure website www.sqa.org.uk/sqasecure

In particular, assessors should refer to the judging evidence tables within the Unit Assessment Support packages for guidance on making assessment judgements for each Outcome and Assessment Standard.

The structure of an assessment used by a centre can take a variety of forms, for example:

- individual pieces of work could be collected in a folio as evidence for Outcomes and Assessment Standards
- assessment of each complete Outcome
- assessment that combines the Outcomes of one or more Units
- assessment that requires more than the minimum competence, which would allow learners to prepare for the Course assessment

Teachers/lecturers should note that learners' day-to-day work may produce evidence that satisfies the assessment requirements of a Unit, or Units, either in full or partially. Such naturally-occurring evidence may be used as a contribution towards Unit assessment. However, this naturally-occurring evidence must still be recorded and evidence such as written reports, recording forms, PowerPoint slides, drawings/graphs, video footage or observational checklists provided.

Unit Assessment Support packages have been provided for this Course. Each support package offers a different approach to assessment of the Units. Centres are at liberty to alter the contexts and structure of the tasks provided to support the needs and preferences of its learners. In addition, centres are encouraged to create their own Unit assessment — these can be prior verified if required using SQA's prior verification service.

In **all** cases, the Outcomes, Assessment Standards and 'Making assessment judgements' columns in the 'Judging evidence' tables found within the support packages provided **cannot** be altered or amended in any way. These support packages should be read in conjunction with each of the related *Unit Specifications.*

In this Advanced Higher Course, it may be that a strand of work that contributes to a Course assessment method is started when a Unit is being delivered and is completed in the Course assessment. In these cases, it is important that the evidence for the Unit assessment is clearly distinguishable from that required for the Course assessment. For example, the creation and evaluation of a design proposal required for Outcome 2 of the Product Development Unit may be taken forward and developed by a learner for the Coursework project.

Added value

Advanced Higher Courses include assessment of added value which is assessed in the Course assessment.

Information given in the *Course Specification* and the *Course Assessment Specification* about the assessment of added value is mandatory.

In Advanced Higher Courses, added value involves the assessment of higher-order skills such as high-level and more sophisticated investigation and

research skills, critical thinking skills and skills of analysis and synthesis. Learners may be required to analyse and reflect upon their assessment activity by commenting on it and/or drawing conclusions with commentary/justification. These skills contribute to the uniqueness of Advanced Higher Courses and to the overall higher level of performance expected at this level.

In this Course, added value will be assessed by means of a project and a question paper.

Preparation for Course assessment

Teachers/lecturers should refer to the following documents to ensure that all the requirements of Course assessment are met:

- Advanced Higher Design and Manufacture *Course Assessment Specification*
- Advanced Higher Design and Manufacture *General Assessment Information*
- Advanced Higher Design and Manufacture *Coursework assessment task* (available at www.sqa.org.uk/sqasecure)

Each Course has additional time that may be used at the discretion of the teacher/lecturer to enable learners to prepare for Course assessment. This time may be used near the start of the Course and at various points throughout the Course for consolidation and support. It may also be used for preparation for Unit assessment, and, towards the end of the Course, for further integration, revision and preparation and/or gathering evidence for Course assessment.

For this Course, the assessment methods are a project and a question paper.

Learners should be given opportunities to practise these methods and prepare for them.

Preparation for the Coursework project

Detailed information on the Coursework project Component of Course assessment can be found in the *General Assessment Information* and the *Coursework assessment task* (project).

The **General Assessment Information** includes:

- an overview of the project, what it is for and its intentions
- the conditions for undertaking the project
- possibilities and limitations in relation to 'reasonable support and guidance'
- the evidence that has to be gathered
- and the actual Marking Instructions for each of the project aspects
- suggested design and manufacture project contexts that might be interesting for the candidate to consider, although these are not mandatory

The **Coursework assessment task** includes:

- an overview of the project
- Marking Instructions (identical to those in the General Assessment Information)
- an assessment record
- comprehensive guidance for the candidate for each aspect of the project (this is found in Appendix 1 which can be detached and given to candidates)

Appendix 1 of the **Coursework assessment task** also provides the candidate with:

- guidance on recording progress
- the assessment requirements for each aspect of the project
- what to consider for each aspect
- additional guidance on research ethics if required
- suggested design and manufacture project contexts

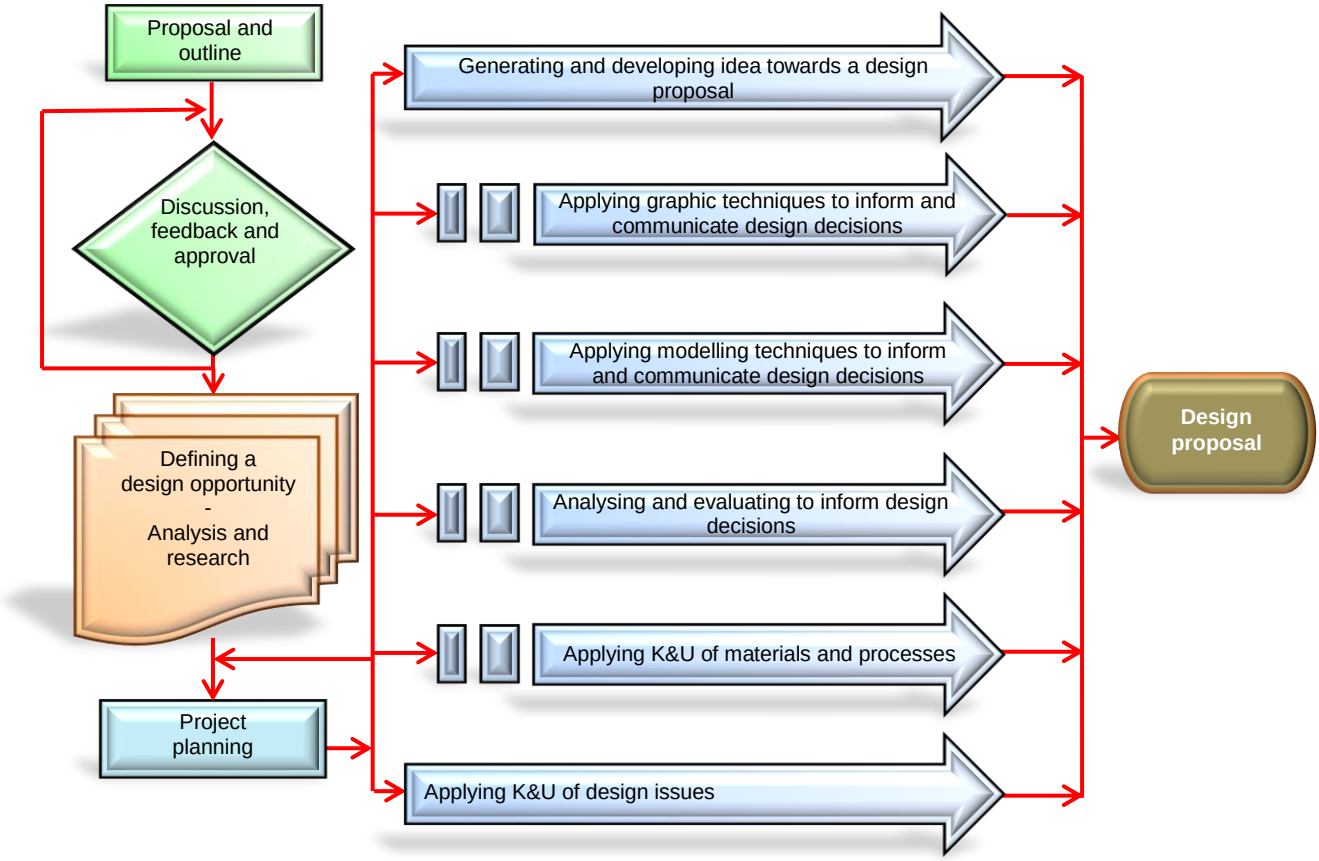
In relation to preparing for the project, teachers/lecturers should explain the requirements to learners and the amount and nature of the support they can expect. However, at Advanced Higher level, it is expected that learners will work with more independence and less supervision and support.

Learners should be given opportunities to develop and practise the skills required for the project, including:

- selecting a topic
- gathering and researching information
- project planning
- evaluating and analysing findings
- developing and justifying conclusions
- presenting information

Undertaking the Coursework project

Whilst there is likely to be variation in the ways in which centres and learners approach the project. A likely model is shown below:



Preparation for the question paper

In relation to preparing for the question paper, learners should be given opportunities to develop and practise the skills required by:

- practising question paper techniques
- revising for the question paper

To support this learning, teachers/lecturers and learners may find it helpful to refer to:

- Advanced Higher Design and Manufacture *Specimen Question Paper*
- Advanced Higher Design and Manufacture *Exemplar Question Paper*
  Advanced Higher Design and Manufacture *Guidance on the use of past paper questions*

Authenticity

In terms of authenticity, there are a number of techniques and strategies to ensure that learners present work that is their own. Teachers/lecturers should put in place mechanisms to authenticate learners' evidence.

For more information, please refer to SQA's *Guide to Assessment*.

Further information on Course/Units

Approaches to learning and teaching

Background to the Course

Design and manufacture is an activity which requires design thinking and the application of knowledge in the creation of possible solutions to genuine problems. A broad range of skills are required by those who intend to work in or with the industry in understanding the requirements, approaches and needs of all involved — and ultimately the end user.

Skills in design and manufacturing are used in a wide range of business and industry sectors. By making sustainable links to local industry and business, centres can add context and value to learning. Professional design studios, engineering, and manufacturing businesses are located throughout Scotland and many also have an online presence. This is especially useful when the learner is considering and undertaking their Course project.

Learner autonomy

Learners should be encouraged to assume increased ownership for their learning and centres should accommodate this as far as possible by creating flexibility in their approaches to the Course. This will help to prepare learners for the level of independence in learning they will be expected to demonstrate in further or higher education sectors and/or employment. Learners will benefit from opportunities to explore existing creative solutions and those they generate themselves.

Planning for learning

Centres should make clear the expectations and the standards required to achieve success in the Course. The level of challenge at Advanced Higher will need careful time management for some learners if they are to complete the Course successfully. Duplication of evidence should be avoided where possible.

Alternatives to physical manufacturing technology

Where the centre does not possess or have access to examples of the latest manufacturing technology, then use of multimedia and web-based resources can be employed to demonstrate the operation and application of these technologies. In addition, there are numerous software applications which can simulate machine paths using common graphic modelling files (.stl) or even stock models downloaded from the web. These can demonstrate an animated visual representation of the ways in which CNC routers, milling machines, lathes or even 3D printers would machine or produce components of a design proposal and as part of a manufacturing process.

Ethical approaches to design
Centres are encouraged to pay close attention to the issues of ethics and sustainability when undertaking design activities. While emphasis is placed on environmental sustainability, the effects of social and economic accountability should not be overlooked, nor should the ethical issues surrounding the decisions they make while designing products.

Selecting products and resources for analysis
The selection of products and scope of design tasks should be sufficiently 'open' to ensure that learners are required to make decisions on their own. Learners are likely to find tasks that have some relevance or personal meaning to them or to their community engaging and enjoyable. Centres should be aware that at certain points in the Course, products will have to be dismantled and in some cases perhaps tested to destruction.

Design and Manufacture: Product Analysis (Advanced Higher) Unit — notes on delivery

This Unit will require learners to carry out an analysis of the performance, production, and impact of a commercial product.

This Unit is intended to be delivered through a wide and varied range of teaching and learning strategies in order that all learners can engage in interesting, exploratory, and experiential learning activities. The Unit contains three Outcomes that progress naturally from one to the other and easily allow the learner to develop their skills and knowledge through analysing products.

Extending the learning: personalisation and choice
Centres should take time to collect together a 'resource bank' of low-cost products for analysis. These products should show a range of joining and assembly methods, be made from a range of different materials, perform a variety of different functions and demonstrate varied aesthetics. These products must be able to be completely stripped down and allow the learners access to the inner workings.

The more experience that learners can have with a wide range of products, the more knowledge they will be able to draw upon for their assessments in Unit and Course.

Centres should allow learners some degree of choice when selecting the product that they will analyse.

Sequence of delivery within the Unit
While there is no prescribed delivery sequence for this Unit, it is suggested that centres approach each of the three Outcomes within the Unit in numerical order, and allow learners to gather assessment evidence as they progress through a series of short learning activities focusing on other products.

Outcome 1
For this Outcome, the teacher/lecturer may want to use group work to allow the learners to investigate the functional requirements and operation of a variety of

products. During this work, the learners should record their decisions (possibly using spider diagrams) and discuss, with reasoned justification, what they feel the best method of evaluating these would be.

Particular attention should be paid in differentiating between objective and subjective questioning when evaluating and testing products. Learners should be encouraged to develop thorough and appropriate product tests.

Group work can be used to carry out a user-trip on products. This is particularly useful when developing initial skills in analysis. The use of online survey designers such as SurveyMonkey or Google Forms could be encouraged to help develop, gather and collate information. Allowing group work will develop the learners' understanding of the importance of a range of opinions, and help develop and deepen their understanding of how to break down the function and operation of products into small, easily identifiable parts. Where group work is not possible due to class size, the learner can still go through the learning process with the teacher/lecturer playing a more active role in the learning experience.

Outcome 2
For this Outcome, it is suggested that it is tackled by learners disassembling at least one product, then considering how they are designed to be assembled. Learners could disassemble a product and record, using photographs, the suitability of any manufactured components and material features that contribute to ease of assembly. To complete the activity, learners should be encouraged to present their findings to their peers and discuss how the design of the products may have been influenced their production methods and assembly.

Care should be taken to make sure all functional testing and evaluation for the first Outcome has been carried prior to disassembly as once disassembly begins it is unlikely that it will be able to be returned to its original state.

During the disassembly of a product, learners can record each key step by taking photographs. These photographs can then be used to describe the assembly, highlighting any important features, commenting on the suitability and appropriateness.

At this stage, centres should take care to ensure that all electrical products have their plugs removed and are not reconnected to the mains supply.

Testing materials
Centres may wish to prepare a range of known materials for learners to test. Learners should be encouraged to conduct tests on any materials that they cannot identify through visual tests. The evidence for this is best presented in the form of a table. Resources containing flow charts for materials testing can be found at on the Consultek website for plastics identification
www.consultekusa.com

Outcome 3
This Outcome draws together the learner's findings from Outcomes 1 and 2 and considers the impact of the chosen product. However, teaching and learning for

this Outcome could be based on a different product to that studied for the earlier Outcomes. Learners must consider the product as a whole, looking in detail at each stage of a product's life to establish its impact.

The learner could consider whether or not the product changed or altered consumer behaviours:

- What was the economic impact of the product — local, national, global?
- Was sustainability considered in relation to the design and manufacture of the product and its disposal after its intended useful life span?
- What effects did the product have on the environment (both globally and locally) from its design, its manufacture, and over its useable lifespan?

This approach will help the learners develop a fuller understanding of the role and impacts products play in our lives.

Much of the learning for this part of the Unit will revolve around initial research on the role products play in our society. Looking at The Ellen McArthur Foundation's online resources about the Circular Economy and the video resources on sustainable design from the http://www.classroomvideo.co.uk website will help enable the learners to develop a wider understanding of the impact products have on the world in which we live.

Once learners have an appreciation and understanding of the wider issues, they should be encouraged to look at the products they have studied and discuss the impact each product will have had at each stage of its life. If group work is challenging due to small class size, then the teacher/lecturer can play an active part in discussions. On completion, the learner should return to their chosen product and describe the impact that the product has had, at each stage of its life, on society, the economy, sustainability and the environment. It is expected that the evidence for this part of the Unit will consist of written text and possibly accompanying photographs.

Design and Manufacture: Product Development (Advanced Higher) Unit — notes on delivery

This Unit allows learners to critically explore and consider design and manufacturing aspects of a commercial product, identifying perceived improvements that might be made, and hence create a design opportunity.

The Unit contains three Outcomes that progress naturally and allow the learner to further develop their design and visualisation skills. The Unit can be used to take the learner through the whole design process, with assessment derived from the learner's response to their own research, brief and specification. However, there is no requirement to combine all Outcomes and approach them in order. Adopting a more focused and pupil-centred approach (considering different activities to suit the learning and teaching for each Unit) could provide a more varied and informative experience for both the teacher/lecturer and learner.

Extending the learning: personalisation and choice
Centres should allow learners some degree of freedom of choice when selecting the product or problem area that they will focus on as part of the assessment, as learners are likely to find tasks that have some relevance or personal meaning to them or to their community more engaging and enjoyable.

However, it is important that when centres select products or focus-issues for the learning activities in the build-up to the assessment, they cover a range of design issues and product types. This will help further equip learners for their final written assessment, which is likely to ask them to draw on their experience of products and design experience.

Sequence of delivery
While there is no prescribed sequence of delivery for this Unit, it is suggested that centres approach the learning and teaching required for this Unit through a series of mini design projects, before allowing learners to draw together all of their experiences and gather assessment evidence from across all of the mini-projects in the Unit.

Delivering this Unit through a series of mini-projects or separate activities, should provide more teaching opportunities and allow both the teacher/lecturer and learner to focus on different parts of the design process. Approaching the Unit in this way should help identify specific skills and knowledge required at each stage of the design process; from the identification of design opportunities and generating initial ideas, to developing, presenting and evaluating design proposals. This focused approach should provide more opportunities for the learner to enhance their own skills, knowledge and understanding required at specific stages of the design process. These smaller projects should also avoid unnecessary repetition and provide the learner with more opportunities to identify strengths and weaknesses in their own work, widen the context of learning and provide a more enjoyable pupil-centred learning environment.

An emphasis on presentation and communication skills should be at the centre of each mini-project or activity, as this will allow skills to develop naturally and be enhanced through time based on the task, quality feedback and contextualisation. However, the type of presentation and range of communication skills used should be appropriate to the design task and stage of the design process being addressed.

Design and Manufacture: Product Evolution (Advanced Higher) Unit — notes on delivery

This Unit allows learners to explore a product in terms of its evolution through focused study. Learners will select a product and identify the key and critical stages of its evolution, considering the various influences which have affected the design and manufacturing decisions taken and changes over time.

This Unit, offered at Advanced Higher, is a new area of study, but continues to build on the knowledge and skills gained from both Higher Design and Manufacture Units. Learners will enhance their understanding of design issues

and their role in the evolution of commercial products, through the analysis of products from the past, present and future. The work in this Unit should not be seen as discrete, but used to supplement and enhance the work undertaken in other Units.

The Unit contains two Outcomes which focus on the impact of developments in materials, manufacturing and technology, and on external factors influencing product evolution. It also asks learners to explore and consider a range of new and emerging technologies and their potential impact on products.

Extending the learning: personalisation and choice
Centres should allow learners some degree of freedom as to how they are going to explore the evolution of products, and how they will present their findings. Selecting an area of study in which they have a genuine interest, will increase the relevance of the activity and make the experience more engaging and enjoyable.

Learner access to resources
It is important that centres ensure that learners have access to a wide range of source material for appropriate research and effective analysis. This should include web links, books, articles, journals and, if possible, a bank of products that reflect product evolution for analysis and identification. Learners should also be encouraged to undertake field trips and visits to obtain information first hand.

It is essential that learners undertake a wide range of activities that allows them to identify and analyse how products are influenced by materials, technology, society and the environment.

Developing research skills
It is important that learners gain experience and a degree of competence in researching and obtaining valid and appropriate research, undertaking more than just internet searches for archive information. The focus should be on the influence, stimulus and impact of evolution. Gaining knowledge from a wide range of products will extend the learners' learning, provide a good knowledge base for both Unit and external assessment, and provide more opportunity for personalisation and choice.

It is important that the learning in this Unit is not derived solely from secondary research, distilling archive material from internet searches. Learners should be encouraged to consider and analyse existing products to develop their own understanding of the influence of materials and manufacturing technologies. A natural starting point for this could come from the learning gained from the Product Analysis Unit. This will help learners identify how materials have been used and how manufacturing technologies have influenced all stages of the design process.

Sequence of delivery
While there is no prescribed sequence of delivery for this Unit, it is suggested that centres approach each of the two Outcomes in the Unit in numerical order. It is important to gather and record information that can be used for assessment as the learner progresses through the Unit.

Using a variety of approaches
It is important that teachers/lecturers provide learners with a range of activities that can be used to explore the influences that materials and manufacturing have had, and will continue to have, on design issues such as aesthetics, function, safety, durability, cost, availability, maintenance and sustainability.

Using products
Teachers/lecturers should encourage learners to explore a range of different products, and use these as a basis for peer discussion on the influences that materials and technologies have had on all aspects of the design process. Learners should begin to understand interrelationship between materials, manufacture and the performance of a product.

Building knowledge and confidence
When learners have become confident in identifying materials and manufacture through first hand experiences, and have formed personal opinions as to how they have influenced the design and manufacture of products, then they can begin to investigate a wider range of materials and manufacturing technologies. Provision of outline timelines on evolution in materials technology, production methods and processes, and manufacturing systems can provide a useful guide for learners.

Other outline timelines relating to social change and critical legislation with regard to change in approaches to economics and the environment (both with relevance to design and manufacture) could be supplied, and used to identify changes and developments to commercial products. This information could be recorded in a personal journal, more detailed learner generated timelines, annotation of images or educational posters.

Building research skills
Before assessing this Unit, it is important to spend time ensuring that learners have the requisite research and investigation skills. Visiting museums and libraries, and making effective use of the school/college librarian can be an excellent source of information and help when beginning an investigation.

Research and investigation techniques should be used to make efficient and effective use of time and resources. Internet searches are not always productive and are frequently inefficient — often providing a large amount of irrelevant information. Therefore, it is valuable to take the required time to assess the learners' ability to use the internet effectively, and provide instruction as to how to make best use of search engines and websites. Using modifiers when doing an internet search will help refine a search and provide better information, eg:

- search for an exact phrase by using quotation marks
- use the negative sign to exclude words
- inserting a tilde (~) before a word will search for similar words to the one you typed
- use numerical ranges to search between specific dates

Scran www.scran.ac.uk is a good site for providing visual images that are catalogued in a similar style to a museum, which can provide very specific information about individual products. Learners should be encouraged to record all sources of information and web links to allow then to revisit information when necessary.

There are a number of approaches that could be taken to address this Outcome. The approach or combination of approaches used will depend on the centre and the learner:

- Using research to identify an example of a chosen product from each decade in the last century. Identifying the external influences that influenced changes to the product, and describing how they influenced the product's evolution.
- Selecting a product and finding examples from each of the influential/prominent design movements of the last century. Researching the influences, beliefs and ideologies of each design movement, and using this information to describe the changes and evolution of the chosen product.
- Identifying influential/prominent designers from the last century. Researching the influences, beliefs and ideologies of each designer and using this information to describe the changes and evolution of the chosen product.

This information could be recorded in a personal journal, detailed timelines, annotated images or educational posters. Use of ICT should be considered as it could enhance the learning experience and provide good quality design material as evidence for assessment.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications are available on SQA's website at: www.sqa.org.uk/sqa//14977.html.
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specification
- Design Principles for National Courses
- *Guide to Assessment*
- Principles and practice papers for curriculum areas
- *SCQF Handbook: User Guide* and SCQF level descriptors
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- *Coursework Authenticity: A Guide for Teachers and Lecturers*

Administrative information

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History of changes to Advanced Higher Course/Unit Support Notes

Version	Description of change	Authorised by	Date
2.0	Additional information on Course assessment provided. Update of mandatory content following Course Assessment Specification revision. Review of 'Approaches to assessment' section following the publication of Unit Assessment Support.	Qualifications Development Manager	May 2015

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